Preparation technology of medical beverages from Black Mulberry (Morus Nigra L)

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Abstract: This research examines the fruit's chemical composition at various stages of ripeness to determine its suitability for beverage production. Tests in the lab measured the levels of sugar, acid, pectin, and vitamins. Sensory tests showed that fruits that are biologically ripe are sweeter than fruits that are technically ripe. Based on these results, different types of medicinal drinks were made by mixing mulberry juice with other fruit extracts. The findings indicate that black mulberry can be transformed into health-enhancing beverages, which not only enhance the fruit's nutritional value but also ensure its availability throughout the year. The study emphasizes its potential utility across various sectors of the food industry.

1 Introduction

The black mulberry, or Morus nigra, is said to be native to Iran, where it has been grown for more than 5,000 years for its edible fruit. Documentation suggests that the plant reached Europe before the establishment of the Roman Empire.

The scientific name Morus nigra originates from Latin. "Mora" indicates "delay," and "nigra" represents "black," alluding to the fruit's dark coloration. Diverse explanations suggest different origins for the black mulberry. Some sources suggest that the plant originated in Asia and was later grown in Europe, the Americas, and Africa. At present, it is widely farmed in Southern Europe and Southwest Asia, where it is regarded as an important fruit by folks in Mediterranean regions [1-5].

The Morus nigra tree loses its leaves in fall and can reach a height of up to 10 meters. The trunk features multiple branches and can display a spectrum of colors from subdued orange to dark gray. Individuals value the tree's visual appeal. The leaves are simple, alternate, thick, resilient, dark green, broadly oval, petiolate, and may display lobes of varied dimensions. The flowers are unisexual and form in spikes. They can be either dioecious or monoecious. Female flowers produce erect, cylindrical spikes, whilst male flowers form clusters that resemble catkins. As they ripen, the fruits become palatable and edible. They are fleshy drupes ranging from 2 to 8.5 cm in length [4–7].

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The trees demonstrate accelerated growth and necessitate much sunlight and space. The ideal distance between trees is at least 4.5 meters. They generally demand minimal fertilizer; however, it is prudent to irrigate them during arid intervals to avert premature fruit abscission. Potted trees necessitate annual repotting before the commencement of fresh growth. The plant flourishes in soils with a pH range of 5.6 to 6.5, which are moderately acidic to alkaline. The ideal temperatures for germination and growth vary from 24°C to 34°C.

Morus nigra is a perennial shrub within the Moraceae family. It has been traditionally used in local medicine for various ailments. The genus Morus includes 68 species and around 100 varieties.

According to the information given in scientific sources, the root, leaves, bark and fruit of the black mulberry plant have medicinal properties. It is known that these parts contain additives and dyes (morin pigment), vitamin C in the leaves, 12-13% sugar in the fruit and dissolved apple and citric acids, amides and amino acids, glycosides, iron and pectin substances.Black mulberry juice and dried fruit have the ability to eliminate malignant tumor cells that occur in the oral cavity and release harmful substances from the body.

In industry, its fruit can be used in the preparation of medicinal canned products, including jam, compote, extract, concentrates, coloring drinks. Although, Black mulberry is considered an important plant, it does not have plantations. Fruit processing technologies are little studied. For this reason, it is urgent to process the Black mulberry fruit and prepare concentrates and various juices.In this regard, scientific research work was carried out in 2019-2022 on the processing of its fruit. 8-10-year-old plant fruits were used for scientific research.To study the chemical composition of the fruit, samples were taken in three repetitions, and carbohydrates, acids and pectin substances contained in it were determined. Among the carbohydrates contained in the fruit, sucrose was determined using a spacharometer, acid Ph meter, based on the method in which pectin was taken.

That is, the sample is grated and refined in 90% alcohol, then 80% alcohol and the third time with acetone. Pectin is extracted from the dried product.According to the results of the study, it was found that the fruit contains 14% sugar, 1.8% malic acid and 0.2% pectin, and it also contains a small amount of 0.3 mg % vitamin C. Abu Ali Ibn Sina recognized that the juices obtained from the fruit can be used medicinally, including in the treatment of upset and gastrointestinal diseases.

Black mulberry fruit typically ripens in late summer. The berries can be harvested at any time during the day, but they should be fully ripe before picking. Once ripe, the fruit naturally detaches from the tree. Harvesting is generally accomplished by shaking the tree and then sorting the fruit by hand. However, picking black mulberries can be challenging because the berries are delicate and prone to collapsing, which can result in staining of the hands and clothing with their dark juice. Additionally, black mulberries have a very short shelf life; if stored for extended periods, their quality can deteriorate [7-9].

2 Methods

Determination of chemical composition of products;

Analyzing the amount of sugar - an RL-refractometer is used. For this purpose, 10 samples of black Mulberry concentrate were taken repeatedly and the sugar content was clarified according to the refractometer indicator. Summarizing the obtained data, the average amount of sugar was determined. When precisining the amount of sugar, the room temperature was specified in the state of 15-20 °C.

The cooled solution was filtered and water was added to the measurement.

Preparation of concentrate from black Mulberry fruit. For this purpose, based on the methodology, a sample of 40 kg of the product is taken from the black Mulberry fruit in three repetitions, and a concentrate is extracted from it. In this case, the amount of concentrate obtained from 100 kg of product, the amount of waste, and the volume of concentrate obtained from 1 ga of square product were determined.

In the preparation of the concentrate, the black Mulberry fruit was taken graphically every three days at the stage of biological maturation and analyzed.

Based on the general methodology of the technology of preparing a healing drink from the concentrate, samples of the drink were prepared in three repetitions.

A number of studies were conducted in order to study the use of black Mulberry fruit as a raw material in the production of various drinks and concentrates, extracts, and dessert wines in the wine industry. For this purpose, technical and biological fruits were picked and juice was obtained from them, the composition, structure and clarity of the finished juices were monitored using an electron microscope Micromet-M.

Table 1. Chemical composition and structural appearance of juice, mg

Options	Amount of dry substance	Sucrose	Fructose	Citric acid	Malic acid	Amount of pectin	Level of sweetness
Technically ripened fruit	15,5	10,2	1,0	1,6	2,3	0,4	5,4
Biologically ripened fruit	20,0	14,0	2,6	1,2	1,8	0,2	9,3

According to the laboratory analysis, it was found that the technically mature fruit of the black Mulberry contains a total of 15.5% dry matter, of which 10.2% sucrose, 1% fructose, 1.6% citric acid, 2.3 mg % malic acid, 0.4% pectin was found to be present. This indicator is 20.0% of the total dry matter in biologically mature fruits, of which 14% sucrose, 2.6% fructose and citric malic acid amounts to 1.2-1.8 mg %, as well as pectin up to 0.2 mg %. (Table 1).

Table 2. Technology of making medicinal juice from black mulberry fruit.

Types of juice	Amount of added juice %					Product samples
	Black mulberry juice.	Raspberry juice.	Jerusalem artichoke juice	Orange juice	Strawberry juice	
Shifo	30	40	30	-	-	
Orom	20	20	-	40	20	

Uzbekistan	40	60	-	-	-	

According to the analysis, it was found that the sweetness level of juice obtained from biologically mature fruit is equal to 9.3 points. It was found that this indicator is equal to 5.4 points in technically ripe fruits obtained for control.

Taking into account these properties of the fruit of shotut, recipes for preparing various medicinal drinks from it were developed. Three types of product samples were created according to the developed recipes (Table 2).

3 Results

Laboratory analyses indicated that ripe black mulberry fruit contains 15.5% dry matter, comprising 10.2% sucrose, 1% fructose, 1.6% citric acid, 2.3 mg% malic acid, and 0.4% pectin. Biologically mature fruit has 20.0% dry matter, 14% sucrose, 2.6% fructose, citric acid levels ranging from 1.2 to 1.8 mg%, and 0.2% pectin. Juice from biologically ripe fruit got a score of 9.3 for sweetness, while juice from technically ripe fruit got a score of 5.4.

From these results, recipes for making medicinal drinks from black mulberry were created, leading to three different products:

- "Uzbekistan" Drink: 40% black mulberry concentrate and 60% raspberry juice.
- "Shifo" Drink: 30% black mulberry concentrate, 40% raspberry juice, and 30% Jerusalem artichoke juice.
- "Orom" Drink: 20% black mulberry concentrate, 40% orange juice, 20% strawberry juice, and 20% raspberry juice.

These drinks are made to help you get more vitamins and have health benefits by using the full potential of black mulberry fruit. The results show that black mulberry needs to be processed to make different juices and concentrates so that this fruit can be found all year round.

4 Conclusion

The investigation into the creation of therapeutic beverages from black mulberry (Morus nigra L.) has yielded the following conclusions:

1. The chemical composition of ripe black mulberry fruit includes 15.5% dry matter, 10.2% sucrose, 1% fructose, 1.6% citric acid, 2.3 mg% malic acid, and 0.4% pectin. Biologically ripe fruit possesses a dry matter composition of 20.0%, comprising 14% sucrose, 2.6% fructose, citric acid levels ranging from 1.2 to 1.8 mg%, and 0.2% pectin. Biologically ripe fruit is 9.3 points sweeter than technically ripe fruit (5.4 points), indicating that fully ripe fruit has superior flavor.

2. The study shows that black mulberry fruit can be used to make a wide range of healthy drinks. We made three different drink recipes to show how black mulberry juice can be used with other fruit juices in different ways. These drinks are better for you than other drinks because they have more vitamins and use the healing properties of black mulberry fruit.

3. Practical Implications: Because black mulberry fruit doesn't last long, it's best to turn it into different juices and concentrates. This technology makes sure that black mulberry

products are always available, no matter what time of year it is. The findings underscore the necessity of enhancing and advancing methods for fruit processing to render black mulberry products more beneficial and commercially viable.

The study underscores the potential of black mulberry as a valuable resource for the development of medicinal and health-enhancing beverages, urging for increased focus on its processing and utilization.

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