ISSN Print: 2664-6536
ISSN Online: 2664-6544
Impact Factor: RJIF **5.4**
IJBB 2023; 5(2): 17-19
www.biosciencejournal.net
Received: 08-07-2023
Accepted: 15-08-2023

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Anthosians of *Morus Nigra* L. fruit growing in the territory of Nakhchivan Autonomous Republic

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DOI: https://dx.doi.org/10.33545/26646536.2023.v5.i2a.45

Abstract
The article provides information about the anthocyanins of the mulberry fruit growing in the territory of Nakhchivan AR. The fruits were studied from the phytochemical aspect and the total anthocyanin content was determined according to the method of Giusti and Wrolstad (2001). Also, the wavelengths of fruit juice were measured in an ultraviolet spectrophotometer. Due to its rich content of flavanol compounds, black smoke has been found to have antifungal and antimicrobial activity. It was also determined that the fruits contain the most cyanidin-3-glucoside, kaempferol-3-O-rutinoside, quercetin-3-O-glucoside, quercetin-3-O-rutinoside, cyanidin-3-O-sophoroside, pelargonidin-3-glucoside and pelargonidin-3-rutinoside compounds. Its fruits mainly contain important flavonoids such as rutin and quercetin. The obtained spectra in the range of 270-490 nm are pelargonidin-3-glucoside, and peaks in the wavelength range of 327-409 nm prove the presence of quercetin-3-O-glucoside compounds. Also, the total anthocyanin content of mulberry fruit was calculated and found to be 542.7 mg/l.

Keywords: Anthocyanin, mulberry, fruit, spectrum, wavelength, quercetin, flavonol

Introduction
Fruits are one of the most valuable foods given to people. Studies have shown an inverse relationship between people's consumption of fruits and vegetables and the risk of cancer. Therefore, phytochemical investigation of fruits and vegetables and determination of antioxidant activity is important in the detection of some specific types of cancer [3].
The high nutritional value and antioxidant activity of the mulberry fruit, which is one of the useful plants growing in the territory of the Autonomous Republic, has greatly increased the importance of this plant. The mulberry plant grows in temperate, tropical and subtropical climate zones due to its high adaptability to different climatic and soil conditions. Cultivated for the benefit of its fruit, leaves and wood, this plant can grow in different temperatures and very different climates, topographic features and soil conditions from the tropical regions of the northern hemisphere to the subtropical regions of the southern hemisphere [1].
Counting the benefits of black fig does not end. It rejuvenates the skin, gives special health to the hair, and at the same time ensures the health of the teeth and gums. The unique unique taste of the fruit is due to the ether formed by ethyl alcohol with linolenic acid. Black plum contains vitamins A, B1, B2, B3, B6, B9, E, C and K, potassium, calcium, sodium, phosphorus, magnesium, iron, zinc and manganese minerals, fiber and organic acids [5]. 100 g of mulberry fruit contains 87.5% water, 1.8-2.8 g of protein, 0.5 g of fat, 8.3 g of carbohydrates, 80 mg of calcium, 40 mg of phosphorus, 0.7-11.3 mg of magnesium, 1.9 mg of iron, 241 mg of potassium, 184 mg of thiamine, 13 mg of ascorbic acid were found. Phytochemical compounds in black mulberry fruits regulate insulin secretion by delaying the digestion of carbohydrates and thus prevent diabetes [4, 6].
The anthocyanin content of each fruit and vegetable is different from the others. As a result of research conducted in recent years, it has been determined that anthocyanins are very important for human health. Anthocyanins are one of the most widespread groups of pigments in the plant kingdom in nature and are present in more or less amounts in almost every fruit. Black mulberry contains higher amounts of phenolic compounds, flavonoids and anthocyanins than other types of mulberry [2, 8].

The mulberry tree is grown in China, Japan, Northern Iran, Syria, Saudi Arabia, Greece, France, Italy, Spain, Russia, North Asia, and also in the United States, Australia, India, Mediterranean countries, Central Europe, and Southern Europe. The history of mulberry fruit in China and Japan dates back to 4000 BC. Mulberry is especially widespread in eastern, western and northwestern Asia, northern Europe, northern Western America, southwestern North America, and some regions of Africa [1].

Materials and Methods

Mulberry fruits were collected from the territory of Nakhchivan city and prepared for analysis in the laboratory. The juice of the fruits was pressed and filtered. Total anthocyanin content was determined according to the method of Giusti and Wrolstad (2001). The difference between the absorbances measured in the spectrophotometer of the samples at pH-1 and pH-4.5 indicates the anthocyanin content of the sample. Therefore, the main purpose of this method is the spectrophotometric measurement of the difference between pH-1 and pH-4.5. In this assay, 2 different solutions were prepared to test the color difference between pH-1 and pH-4.5 [3].

pH-1: 250 ml of 0.2 N KCl (14.9 g/L), 650 ml of 0.2 N HCl (17 ml/L) solution are mixed in a flask. The pH of the solution should be 1, if not, adjust with HCl.

pH-4.5: 1.64 g Na-acetate is dissolved in 100 ml pure water and 1 N HCl (83 ml dilute HCl/L) is added.

Sample preparation: 5 ml of mulberry juice samples are taken to obtain absorbance in the maximum wavelength range of 0.4-0.8, poured into a 50 ml flask, made up to the mark of the flask with pure water, and the dilution value is recorded.

Pour 10 ml of this prepared solution into 2 separate flasks, adjust the pH of one to 1.0 and the other to 4.5 with a strong acid (0.1 N HCl solution) or alkali (0.1 N NaOH) in a pH meter. These samples were transferred to a 50 ml flask and filled with solutions of the same pH. The surfaces of the prepared flasks were covered with aluminum foil to prevent light and kept in the refrigerator for at least 2 hours.

Absorbans = (A516 – A700) pH 1,0 – (A516 - A700)pH 4,5

The total anthocyanin content in the sample was calculated using the following formula.

$$\text{Total anthocyanin, mg/l} = \frac{(A)\,(103)\,(MW)\,(DF)}{(E)\,(L)}$$

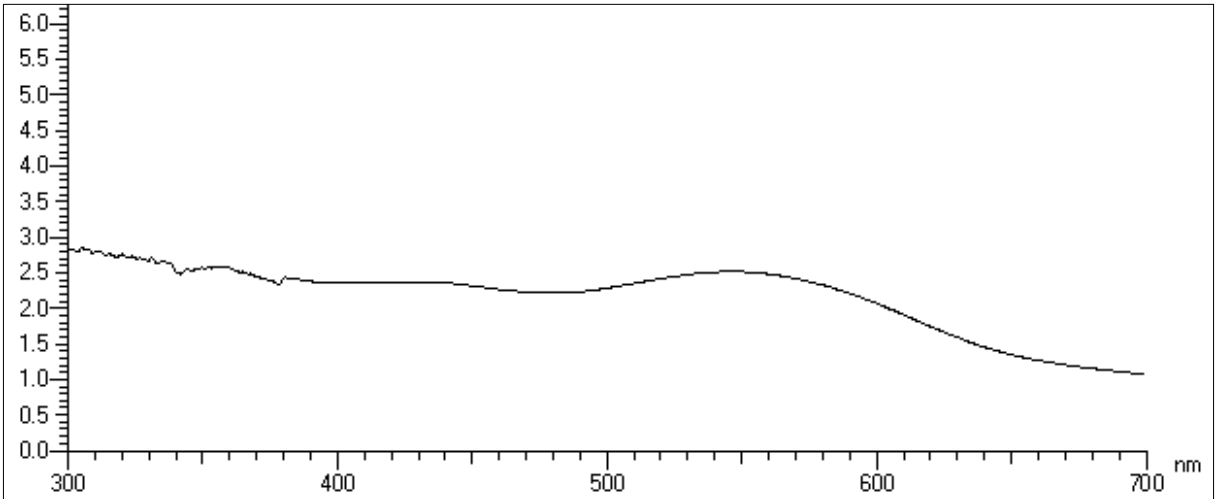
A-absorbance, MW-molar mass of pigments, DF-dilution factor, E-molar absorbance, L-cuvette thickness

The difference between the measured wavelengths of the samples at 516 and 700 nm was calculated and the difference in absorbance found for pH-1 was subtracted from the difference in absorbance found for pH-4.5 and the true wavelength was found. The UV spectrum of fruit juice was also measured [7].

Results

Since the composition of black mulberry fruit is rich in flavanol compounds, it also has antifungal and antimicrobial activity. Of the anthocyanins, the most common are cyanidin-3-glucoside, also there are kaempferol-3-O-rutinoside, quercetin-3-O-glucoside, quercetin-3-O-rutinoside, cyanidin-3-O-sophoroside, pelargonidin-3-glucoside and pelargonidin-3-glucoside, pelargonidin-3-rutinoside compounds. Its fruits mainly contain flavonoids rutin and quercetin. The antioxidant activity of black mulberry fruit is high. Due to the abundance of such useful compounds, these fruits are considered a natural source of antioxidants. The total anthocyanin content of mulberry fruit was calculated and found to be 542.7 mg/l.

UV spectra of juice obtained from mulberry fruits were taken and it was determined which compounds the received wavelengths belong to. Spectra in the range of 270-490 nm are pelargonidin-3-glucoside, and peaks in the wavelength range of 327 - 409 nm are indicative of quercetin 3-O-glucoside compound (Fig. 1).



Peak #	Start (nm)	Apex (nm)	End (nm)	Height (Abs)	Area (Abs*nm)	Valley (nm)	Valley (Abs)
1	700.0	546.5	480.5	2.513	426.212	480.5	2.213
2	480.5	423.5	402.5	2.371	181.641	402.5	2.346
3	402.5	380.5	378.5	2.426	58.194	378.5	2.327
4	378.5	355.5	341.5	2.592	93.829	341.5	2.474

Fig 1: UV spectrum of mulberry juice

Conclusion

Mulberry fruits were collected from the territory of Nakhchivan city and their phytochemical composition was studied. The anthocyanin content of mulberry fruits was studied, and the total amount of anthocyanins was determined. The total anthocyanin content of mulberry fruit was calculated and found to be 542.7 mg/l. Spectra in the range of 270-490 nm are pelargonidin-3-glucoside, and peaks in the wavelength range of 327 - 409 nm are indicative of quercetin 3-O-glucoside compound. It was also determined that mulberry fruits are rich in flavonoids: rutin and quercetin.

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