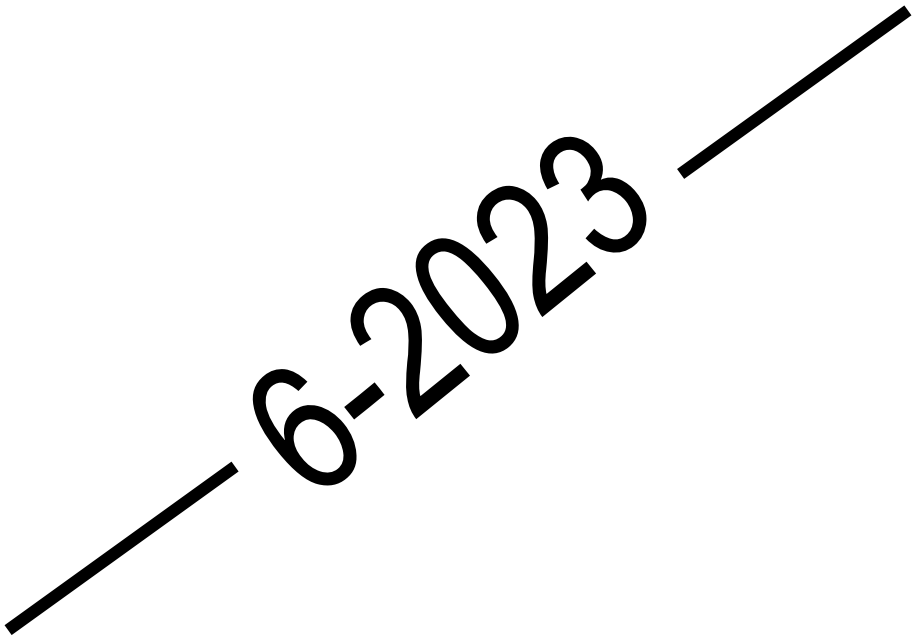
O‘ZBEKISTON RESPUBLIKASI

OLIY TA’LIM, FAN VA INNOVATSIYALAR VAZIRLIGI

FARG‘ONA DAVLAT UNIVERSITETI

# FarDU. ILMIY XABARLAR

1995-yildan nashr etiladi
Yilda 6 marta chiqadi




# НАУЧНЫЙ ВЕСТНИК. ФерГУ

Издаётся с 1995 года
Выходит 6 раз в год

## Aniq va tabiiy fanlar

FIZIKA– TEXNIKA



KIMYO

KIMYO

UDK: 663.64:579.68 DOI: 10.56292/SJFSU/vol29_iss6/a106

# ICHIMLIK SUVLARI UCHUN TABIIY RANG

# НАТУРАЛЬНЫЙ КРАСИТЕЛЬ ДЛЯ ПРОХЛОДИТЕЛЬНЫХ НАПИТКОВ

# NATURAL COLOR FOR DRINKING WATERS

**Askarov Ibrohim Rahmonovich**[1]
[1]Andijan Davlat universiteti, Kimyo fanlari doktori, professor

**Abdullaev Shavkat Voxidovich**[2]
[2]Namangan Davlat universiteti, Kimyo fanlari doktori, professor,

**Haydarov Eldorbek Rahimjon o'gli**[3]
[3]Namangan davlat universiteti, doktorant

***Annotatsiya***

*Alkogolsiz ichimliklar oziq-ovqat do'konlari javonlarini to'ldiradi. Qizil tusli ichimliklar qiziqish uyg'otadi. Ish biologik faol moddalarni o'z ichiga olgan amarant o'simlikiga asoslangan oziq-ovqat rangini taklif qiladi. Bo'yoq rutin, flavonoidlar va boshqa biologik faol moddalarni o'z ichiga olgan Yapon Sophora (Safora) asosida ishlab chiqariladi.*

***Аннотация***

*Прохладительные напитки заполняют прилавки продовольственных магазинов. Вызывают интерес напитки с красным оттенком. В работе предлагается пищевой краситель на основе растения амарант который содержит также и биологически активные вещества. Краситель изготовлен на основе софоры японской (Safora), которая содержит рутин, флавоноиды и другие биологически активные вещества.*

***Abstract***

*Soft drinks are filling the shelves of grocery stores. Drinks with red tints are of interest. The work proposes a food coloring based on the amaranth plant, which also contains biologically active substances. The dye is made on the basis of Japanese Sophora (Safora), which contains rutin, flavonoids and other biologically active substances.*

***Kalit so'zlar:*** *distillangan suv, rangsiz turli xil ichimliklar, amarantin, rutin.*
***Ключевые слова:*** *дистиллированная вода, различные напитки без окраски, амарантин, рутин.*
***Key words:*** *distilled water, various drinks without coloring, amaranthine, rutin.*

## INTRODUCTION

As a result of the growth of the world population and the expansion of cities, the demand for paint products is also increasing. In addition to natural sources, artificial and synthetic dyes and food additives have to be used in construction and food coloring. Ensuring that the composition of paints consists of natural components so that they do not have a harmful effect on the human body is one of the urgent tasks today. According to the World Health Organization, various diseases have increased due to dyes. In the treatment of these diseases, natural dyes are used along with modern medical methods in most countries of the world. In the construction and food industry, the weight of synthetic dyes is large, which causes unpleasant conditions for human health. In this regard, taking into account the importance of researching plant sources of natural dyes rich in biologically active compounds and putting them into practice, developing food dyes based on composite dyes for coloring food products, classification of new products based on their chemical composition and introduction into practice is of great scientific and practical importance. Creation and introduction of productive varieties of amaranth suitable for local climatic conditions in Uzbekistan, processing of cultivated raw materials, research of the chemical composition of medicinal phytotea and dye products obtained by processing the leaf and flower parts of amaranth plant varieties, the isolated components it is important to study their biological activities and apply them to relevant fields.

## LITERATURE ANALYSIS AND METHODS

As natural dyes have changed over time, they have been supplanted by stable artificial dyes. Color is the main indicator of food products. Even today, natural dyes are used from red beets, various fruits and other natural sources. Natural dyes contain only non-toxic biologically

active substances: polyphenols, organic acids, vitamins and other biologically active substances. Plant pigments protect cells in the human body from abundant light energy, UV radiation and other foreign influences. In Russia, the following vegetable pigments are allowed to be widely used: carotene (E160, E161), anthocyanin (B 163), red beetroot (E162). Flavanoid-type anthocyanin dye in amaranth can have OH groups methylated or acetylated. In the carbohydrate part, anthocyanins can contain glucose, rhamnose, galactose, or trisaccharides. The carbohydrate moiety is often linked in 3 at least 5 positions. Emperical formula of amaranth is C30H35N2O19, molecular mass is 711. This red-violet pigment contains aglycone betanidin with glucose and glucuronic acid attached to its 5-position. Generally, anthocyanins are easily soluble in water and polar solvents, but difficult in alcohol and benzene. There is a lot of interest in this dye because the dye obtained from the amaranth plant contains betacyanins, caratinoids, flavanoids, and chlorophylls. A 1% solution of hydrochloric acid in methanol alcohol is used for natural dyes from traditional plant raw materials. The main raw materials are plants containing anthocyanins, juice and canning industry waste. The following scientific research is the application of technologically updated methods from the leaves and flowers of amaranth (Amaranthus caudatus, Amaranthus paniculatus), to study their properties and use them as food dyes. Water-soluble anthocyanin dyes are obtained from various organs of the plant (leaves, inflorescences, stems, veins, fruits). Experiments use freshly picked plant organs or crushed raw materials dried at 400C. Often, raw materials contain additives, for drying of which centrifugation, ion exchange chromatography, gel filtration on various carrier materials, dialysis, etc. are used. The anthocyanins are separated by extracting the dried crude with water or 70% alcohol. Previous investigations showed that pigment is found in three forms in amaranth leaves, i.e. protein-bound-2.7%, pectin-bound-0.7% and free form-1.7%. When the plant is extracted with citric acid, the pectin in the pectin-bound dye is hydrolyzed. Freshly ground plant material is ground in a homogenizer. Proteins are transferred in the presence of neutral salts, at the isoelectric point and at a low temperature of $40^{C}$. Fractions of low and high molecular weight substances are separated by dialysis. High-performance liquid chromatography is used to purify pigments. Ion exchange chromatography is the difference of acid-base properties of substances, filtering in sephadex is based on the difference of molecular masses of substances. Spectroscopic criteria for determining the purity of pigments are often based on chromophore and ultraviolet optical density. Amaranth's UV spectrum has two maxima: 280nm and green at 537nm, so the solution is red-violet. During the development of the technological method, amaranthine dye was extracted from flowers and leaves of Amaranthus lear and Amaranthus paniculatus in different solvents. Distilled water was used as a solvent. Freshly picked and pre-dried raw materials were taken in the experiment. Freshly harvested raw materials and water were mixed in a ratio of 1:2 and 1:10 with dried raw materials. Then it was separated from the precipitate by centrifugation. It was dried at t=300C, because at high temperature the pigment is destroyed and turns into dark reddish polymers.

## RESULTS AND DISCUSSION

Amaranthus caudatus dried flowers and freshly picked flowers are given in table 1-2.

**Extraction of dye from dried flowers of Amaranthus lear[5]**

***Figure 1***

| | Flower mass, gr | Volume of water, ml | Dye solution, ml | Solution pH | Dry matter, gr | Fruitfulness relative to dry mass |
|---|---|---|---|---|---|---|
| 1 | 5 | 50 | 22 | 6 | 0,028 | 0,133 |
| 2 | 10 | 100 | 75 | 6 | 0,073 | 0,101 |
| 3 | 15 | 150 | 86 | 5 | 0,078 | 0,094 |
| 4 | 17 | 170 | 11 | 5 | 0,120 | 0,094 |
| 5 | 20 | 200 | 134 | 6 | 0,122 | 0,092 |

**Extraction of dye from freshly picked dried flowers of Amaranthus lear**

***Figure 2***

| N | Flower mass, gr | Volume of water, ml | Dye solution, ml | Solution, pH | Dry matter, gr | Fruitfulness % relative to dry mass% |
|---|---|---|---|---|---|---|
| 1 | 5 | 10 | 6 | 6 | 0,005 | 0,084 |
| 2 | 10 | 20 | 11 | 6 | 0,008 | 0,080 |
| 3 | 15 | 30 | 17 | 6 | 0,014 | 0,086 |
| 4 | 20 | 40 | 26 | 5 | 0,025 | 0,090 |
| 5 | 25 | 50 | 32 | 6 | 0,028 | 0,090 |

## CONCLUSION

Since the dye in amaranth extracted with natural water does not last long, we extracted the red dye with citric acid and sophora buds. The obtained paint was irradiated under the influence of an electric lamp for 30 days, during which the color did not change. 15-20 ml of the resulting paint was poured into 100 ml of carbonated drinking water. A red colored drink was obtained. "Chortoq" mineral and mineral drinks, because the color did not change under the influence of the lamp within 30 days. "Borjomi", "Nestle", "Zam-zam" were also used to obtain red drinks.

**USED LITERATURE:**

1. Архипова, А.Н. Пищевые красители, их свойства и применение // Пищ. промышленность, 2000; N 4, С. 66-69

2. Белодедова, А.С. Натуральные красители в индустрии напитков // Ликероводоч.пр-во и виноделие, 2003; N 10, С. 5

3. Гинс, М.С. Культура амаранта (род Amaranthus L.) как источник амарантина: его функциональная роль, биологическая активность и механизмы. //Диссертация на соискание ученой степени доктора биологических - Петербург, 2003. 328 с.

4. Гинс, В.К., Кононков, П.Ф., Гинс, М.С, Кононков, Ф.П. «Способ получения натурального краснофиолетового пищевого красителя». 1998. Патент № 2118971.

5. Михеева Л.А., Михеева А.В. Амарантин как перспективный краситель для пищевой промышленности. Наука Росии.Цели и задачи,2022,34-37стр. doi.10.18411/nrciz.12-2022-09