PAPERS IN ENGLISH

CHEMISTRY SCIENCES

ANALYTICAL CHEMISTRY

DOI - 10.32743/UniChem.2024.117.3.16987

CHEMICAL COMPOSITION OF SAFFRON STIGMAS (Crocus sativus L.) AND SIGNIFICANCE IN FOLK MEDICINE

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ХИМИЧЕСКИЙ СОСТАВ РЫЦАЛКА ШАФРАНА (Crocus sativus L.) И ЗНАЧЕНИЕ В НАРОДНОЙ МЕДИЦИНЕ

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ABSTRACT

Saffron stigmas have been used by mankind since ancient times as a medicinal product in folk medicine for the treatment of many diseases. Even in today's advanced medical era, it is cultivated in many countries of the world and is widely used in the fields of food, pharmaceuticals, and medicine. Its healing properties are due to its rich chemical composition. According to its chemical composition, it is rich in several types of organic compounds and inorganic compounds. This article discusses the results of the analysis of mineral and flavonoid content of saffron stigmas grown in Uzbekistan.

АННОТАЦИЯ

Рыльца шафрана издревле использовались человечеством как лекарственное средство в народной медицине для лечения многих заболеваний. Даже в современную развитую медицинскую эпоху его выращивают во многих странах мира и широко используют в пищевой, фармацевтической и медицинской сферах. Его целебные свойства обусловлены богатым химическим составом. По химическому составу он богат несколькими типами органических и неорганических соединений. В данной статье рассмотрены результаты анализа минерального и флавоноидного состава рыльцев шафрана, выращенного в Узбекистане.

Keywords: saffron stigmas, minerals, flavonoids, HPLC, gallic acid, rutin, apigenin and kaempferol.

Ключевые слова: рыльца шафрана, минералы, флавоноиды, ВЭЖХ, галловая кислота, рутин, апигенин и кемпферол.

Библиографическое описание: Askarov I., Ubaydullayev K. CHEMICAL COMPOSITION OF SAFFRON STIGMA (Crocus sativus L.) AND SIGNIFICANCE IN FOLK MEDICINE // Universum: химия и биология : электрон. научн. журн. 2024. 3(117). URL: *https://7universum.com/ru/nature/archive/item/16987*

1. Introduction

Crocus (Crocus sativus L.) is a perennial herb belonging to the Iridaceae family[1]. Saffron has been cultivated since the end of the Bronze Age in countries located in the Mediterranean basin. Its long crimson flowers are highly prized for their aromatic flavor and golden-yellow coloring. They were also used to dye textiles[2].

Today, saffron is cultivated in many countries of the world. Although Iran takes the leading place in this regard, Greece, India, Azerbaijan, France, Italy, Austria, Belgium, Germany, Holland, Spain, Hungary, China, Japan, Norway, Russia, Morocco, Turkey, Israel, Egypt, United Arab Emirates, is also grown on a smaller scale in Mexico, Switzerland, Algeria, Australia and New Zealand[3].

Saffron is the most expensive spice in the world because of its edible three-horned and dried stigmas[4].

Saffron contains more than 150 volatile and non-volatile chemical compounds. These include carotenoids, anthocyanins, lycopene, α- and β-carotene, zeaxanthin, crocetin and a number of volatile and non-volatile active compounds that provide biological activity. At the same time, flavonoids, vitamins (especially riboflavin and thiamin), amino acids, proteins, starch, minerals and various other chemical compounds have been found in saffron. Crocin, crocetin, picrocrocin and safranal are the four main and biologically active compounds in saffron[5].

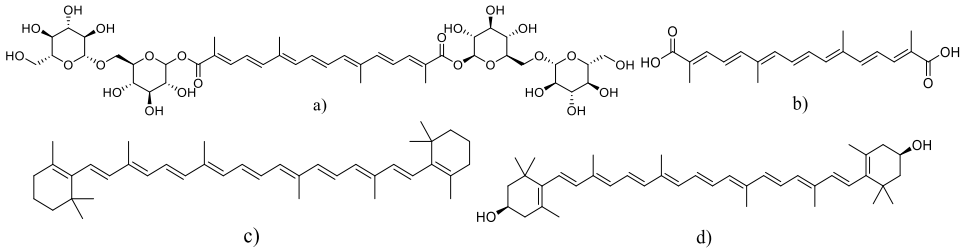


Figure 1. Important biologically active compounds found in saffron: a) crocin; b) crocetin; c) β-carotene; d) zeaxanthin

As a medicinal plant, saffron has traditionally been used as an antidepressant, respiratory disease, antispasmodic, and sedative. In folk medicine, it is used against smallpox, colds, asthma, eye and heart diseases, and cancer[6].

In animal experiments, aqueous and ethanolic extracts of saffron corms and petals have been shown to have acute and chronic antinociceptive and anti-inflammatory effects, as demonstrated by the twist test, xylene-induced ear edema in mice, and rat paw confirmed by formalin-induced swelling. This supports its traditional use as an antitumor agent[7,8].

The methanolic extract of saffron florets and its safranal, crocin, and other components have been reported to have radical scavenging activity, which allows it to be used as a treatment for age-related diseases, cosmetics, food additive, etc.[9].

2. Methods

2.1. Experimental part

Determination of macro and microelements in saffron stigmas by AVIO 200 (ISP-OES) optical emission spectrometric method[10]. In order to analyze the sample of saffron stigmas, it was first dried in a drying cabinet (VWR DRY-line, Germany) until the mass did not change. 200 mg of the completely dried sample is weighed on an analytical balance (FA 220 4 N) for mineralization, i.e. to turn it into a clear solution. A mineralization device (MILESTONE Ethos Easy, Italy) was used to mineralize the sample. For this, a sample (200 mg), 6 ml of nitric acid (HNO_3) purified on the basis of distillation, i.e. acid distilled in an infrared acid purification device (Distillacid BSB-939-IR) and 2 ml of hydrogen peroxide (H_2O_2) as an oxidizer, are placed in the test tube of the device. is placed. 20 min. during 1800C, all the mixture is mineralized.

After the mineralization process is completed, the mixture in the test tube is diluted with distilled water (BIOSAN, Latvia) to 25 ml in a separate conical volumetric flask.

The solution in the flask is put into special test tubes in the Autosampling Department and placed for analysis. The prepared sample was analyzed in an Avio 200 (ISP - OES) inductively coupled plasma optical emission spectrometer (Perkin Elmer, USA). The accuracy of the device is high, and it allows to measure the elements contained in the solution to an accuracy of 10^{-9} g.

2.2. Experimental part

Qualitative and quantitative determination of flavonoids in saffron stigmas[11,12]. We used 96% ethyl alcohol as a solvent to extract the substances to be determined from the saffron sample. For this purpose, 0.5 grams of saffron sample was taken, mixed with 20 ml of alcohol and extracted using a magnetic stirrer at a temperature of 30°C for 75 minutes. As a stationary phase, the amount of rutin, gallic acid and quercetin in the samples was determined using an Agilent Zorbax 4.6 mm ID x 12.5 mm cartridge and a Perkin Elmer C18 250x4.6 mm 5 mm C18 (USA) column. For this, a 0.5% solution of acetic acid in a ratio of 35:65 and standard solutions in acetonitrile with different concentrations: 0.025 mg/ml and 0.05 mg/ml were prepared, the flow rate was 1 ml/min, the temperature of the thermostat was 400C, the injection sample volume was 10 µl. a calibration curve was generated. Based on the standard samples, 2.5 min of gallic acid, 3.6 min of rutin, and 16 min of quercetin were chromatogramed on an HPLC device (LC 2030 C3D Plus Shimadzu Japan).

3.1. Results and Discussions

The results of the analysis of the amount of micro- and macroelements in the saffron stigmas.

Table 1.

Results of elemental analysis of saffron stigmas

№	Elementname	Quantity	№	Elementname	Quantity
1	Lithium	0,139	8	Iron	26,04
2	Tellurium	28,05	9	Sodium	20,15
3	Strontium	1,225	10	Zinc	74,33
4	Potassium	375,4	11	Copper	1,025
5	Manganese	2,380	12	Phosphorus	432,2
6	Bor	0,675	13	Sulfur	35,87
7	Calcium	111,5	14	Magnesium	160,3

According to the data shown in the table 1 based on the analysis, it can be said that the most common element by weight in the composition of the saffron flower buds examined by us is phosphorus, and its quantitative value is 432 per 100 g of 2 mg sample. Next, potassium 375.4 mg, magnesium 160.3 mg and calcium 111.5 mg were the most abundant elements in the saffron flower.

Results of the analysis of the content of flavonoids in saffron stigmas.

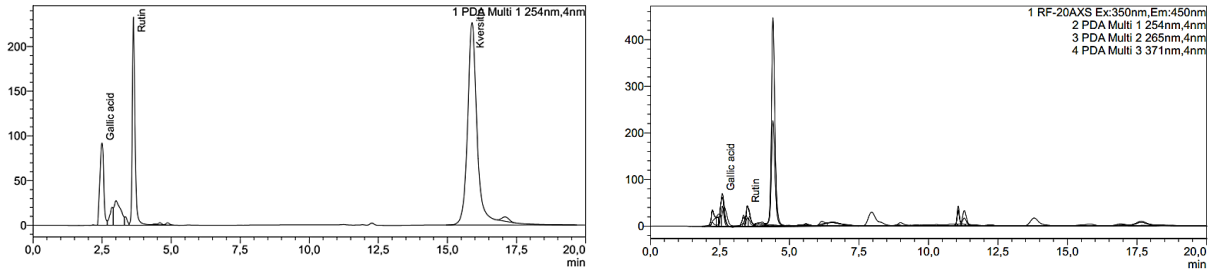


Figure 2. Chromatograms of standards (gallic acid, rutin,) and saffron solutions

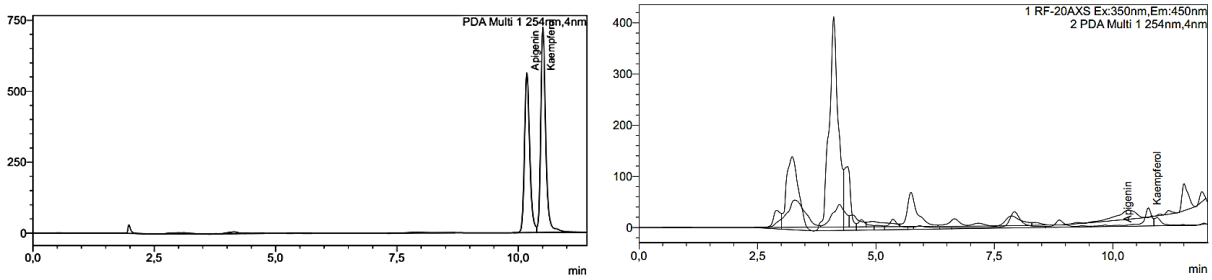


Figure 3. Chromatograms of standard and saffron solutions

By comparing the chromatograms of srandart and saffron solutions in the above pictures, it can be seen that the saffron solutions contain gallic acid, rutin, apigenin and kaempferol. Their amount is shown in the table below.

Table 2.

Quantity of some flavonoids in saffron extract (mg/g)

Gallic acid	Rutin	Quercetin	Apigenin	Kaempferol
1.6	0.56	0	0.04	0.4

In the images of chromatograms of saffron corm extracts (Figures 2 and 3), peaks characteristic of gallic acid, rutin, apigenin and kaempferol compounds can be seen at 2.49, 3.63, 10.17 and 10.5 minutes, respectively. There is no peak characteristic of quercetin.

4. Conclusion

When the amount of macro and microbiological elements in saffron corms was checked using modern physico-chemical methods, phosphorus, potassium and

calcium were the most abundant elements in its composition.

When analyzing the amount of phenolic and flavonoid compounds such as gallic acid, rutin, apigenin and kaempferol in saffron corms, it was found that these compounds are present in saffron corms. As a result of the analysis, it was proved that gallic acid-1.6 mg%, rutin-0.56 mg%, apigenin-0.04 mg% and kaempferol-0.4 mg%;

References:

1. Askarov I.R. "Encyclopedia of medicine" Tashkent "Classic word" 2019, p. 379.[In uzbek]
2. Temperini O., Rea R., Temperini A., Colla G., Rouphael Y. Evaluation of saffron (Crocus sativusL.) production in Italy: Effects of the age of saffron fields and plant density // Journal of Food, Agriculture & Environment Vol.7 2009 (1).pp.19-23.[In English]
3. Abdullaev F.I., Espinosa-Aguirre J.J. Biomedical properties of saffron and its potential use in cancer therapy and chemoprevention trials// Cancer Detection and Prevention 28(2004) pp.426-32 [In English]
4. Goldblatt P., Davies T.J., Manning J.C., Bank M., Savolainen V. Phylogeny of Iridaceae Subfamily Crocoideae Based on a Combined Multigene Plastid DNA Analysis. // Journal of Systematic and Floristic Botany 22(1) (2006): Article 32.p 399-411. [In English]
5. Al-Snafi A.E. The pharmacology of Crocus sativus-A review. IOSR J. Pharm. 2016, 6, 8–38. [In English]
6. Abdullaev F.I. Cancer chemopreventive and tumoricidal properties of saffron (Crocus sativus L.). ExpBiol Med Maywood 2002;227:20–25.[In English]
7. Bhargava V.K. Medicinal uses and pharmacological properties of Crocus Sativus Linn (Saffron) // Int J Pharm PharmSci, Vol 3, Suppl 3, 2011, 22-26. [In English]
8. Asqarov I.R., Muminovich M.M., Yusupovna M.I., Shokirjonovic U.X. The Effect of Oils Extracted from The Seeds of Althea Officilanis and Nigella Sativa Plants on Inflammation// Journal of Chemical Health Risks. (2023) 13(5), 413-418 | ISSN:2251-6727. [In English]
9. Assimopoulou A.N., Sinakos Z., Papageorgiou V.P. Radical scavenging activity of Crocus sativus L. extract and its bioactive constituents // Phytother Res. 2005; 19(11): 997-1000. [In English]
10. Askarov I.R., Razzakov N.A., Xomidov J.J., Razzakov Z.N. Ethnobotanical Study of Acclimatized Lavender in Uzbekistan// Journal of Advanced Zoology. Volume 44 Issue 04 Year 2023 Page 315:319.[In English]
11. Askarov I.R., Razzakov N.A., Razzakov Z.N. Chemical Composition of Lavender Acclimatized in Uzbekistan and Its Use in Folk Medicine// Journal of Advanced Zoology. Volume 44 Issue 03 Year 2023 Page 931:934
12. Islomova S.T., Asqarov I.R., Bussmann R.W., Khojimatov O.K., Muhammad Z., Makhkamov T. Ethnobotany, medicinal utilization and analysis of biogenic elements and flavonoids of Apiumgraveolens and Tussilagofarfara from Uzbekistan// Ethnobotany Research and Applications 26:36 (2023) - http://dx.doi.org/10.32859/era.26.36.1-12.