ANALYSIS OF SOME PHENOL COMPOUNDS AND VITAMINS IN LEAVES OF TURNIP (BRASSICA RAPA L) GROWING IN UZBEKISTAN

I.R. Asqarov[1], N.B. Atakulova[2], G.A. Madaminova[3], S.B.Odilova[4].

[1] Professor of the Department of Chemistry, Doctor of Chemical Sciences (DSc)
[2] Acting Associate Professor of the Department of Chemistry, Doctor of Philosophy (PhD) in Chemistry
[3,4]Master's student, Andijan State University

ANDIJAN STATE UNIVERSITY

Abstract: This article presents a comprehensive study of turnip leaves (Brassica rapa L.) grown in Uzbekistan, focusing on their botanical classification, morphological characteristics, distribution, and chemical composition. Turnip belongs to the Brassicaceae family and is one of the widely cultivated vegetable crops with significant importance in agriculture and the food industry. In common practice, the edible root is mainly utilized, while the leaves remain insufficiently studied despite their potential nutritional value.

The research describes the main vegetative organs of the plant, including the root, stem, and leaves, with particular emphasis on the biological and nutritional properties of turnip leaves. The results revealed that turnip leaves are rich in essential macro- and microelements, proteins, vitamins, and biologically active phenolic compounds that are beneficial to human health.

The content of macro- and microelements, as well as the quantitative composition of phenolic compounds, was determined using the High-Performance Liquid Chromatography (HPLC) method. Ethanol, acetic acid, and acetonitrile were used as extraction solvents during the analysis. The findings demonstrated that turnip leaves contain significant amounts of phenolic compounds, including flavonoids such as apigenin, which exhibit strong antioxidant activity.

Phenolic compounds play a crucial role in protecting the human body from oxidative stress by neutralizing free radicals and reducing the risk of various chronic diseases. Therefore, turnip leaves can be considered a valuable natural source of antioxidants.

The obtained results indicate that turnip leaves have high potential for use as functional food ingredients, dietary supplements, and pharmaceutical raw materials.

Keywords: turnip leaf, root, stem, leaf, protein, acetic acid, acetonitrile, phenol, vitamin, ethanol, apigenin.

Introduction.

Today, in our country and around the world, there is an increasing need and demand for the study of plants rich in biologically active substances. The reasons for this are the increasing incidence of oxidative stress, cardiovascular diseases, oncological and metabolic diseases in the modern lifestyle. Natural products with antioxidant properties are of great importance in the prevention of these diseases.

Among them, plants belonging to the brassicaceae family are in the leading position. In particular, turnip (brassica rapa L) is distinguished by its richness in phenolic compounds, vitamins and minerals. In our daily life, the root of turnip is consumed as food. However, its leaves are often not appreciated. In fact, the leaves of turnip are richer in biologically active substances than its root and have high antioxidant activity.

The climatic conditions of the country are favorable for the cultivation of this particular turnip, and all local varieties have their own chemical composition. Therefore, the study of phenolic compounds and vitamins in turnip leaves grown in Uzbekistan is a topical issue. In Uzbekistan, turnips are mainly grown in the Andijan, Namangan, Fergana, Tashkent, Samarkand and Kashkadarya regions. Local climatic conditions are favorable for the synthesis of high amounts of phenolic compounds and vitamins in turnip leaves.

The main phenolic group of flavonoids in turnip leaves is quercetin - a strong antioxidant, has anti-inflammatory effects; kaempferol - protects the heart and circulatory system; isorhamnetin - slows down the aging process of cells. Flavonoids bind free radicals and protect cell membranes from oxidation. The main phenolic acids in turnip leaves are gallic acid, ferulic acid, chlorogenic acids. These acids have antioxidant and antimicrobial properties.

Turnip leaves are also rich in vitamins important for the human body. Vitamin C (ascorbic acid) - strengthens immunity, participates in collagen synthesis, vitamin A (β-carotene) - improves vision, is useful for skin health, vitamin K - regulates blood clotting, strengthens bone tissue, B vitamins (B1, B2, B6, folate) - play an important role in the functioning of the nervous system and energy metabolism. Vitamins in turnip leaves have a synergistic effect with phenolic compounds, increasing their biological value.

Experimental part: Determination of phenolic compounds. Standard solution, sample extract Shim pack GIST C18 reversed-phase column (150 × 4.6 mm; 5 µm, Shimadzu, Japan) and a gradient mobile phase consisting of acetonitrile (A) and a 0.5% solution of acetic acid in water (B) (Table 1) were used. The injection volume was 10 µl, the flow rate was 0.5 ml/min, and the column thermostat was set to 40 oC. The analytical signal (peak area) of phenolic compounds was recorded at 300 nm (Figure 1).

Research results:

Table 1.

Mobile phase gradient program.

Time	Acetonitrile (A), %	0.5% acetic acid (B), %
0	5	95
5	5	95
17	40	60
22	40	60
22,1	5	95
40	ending	

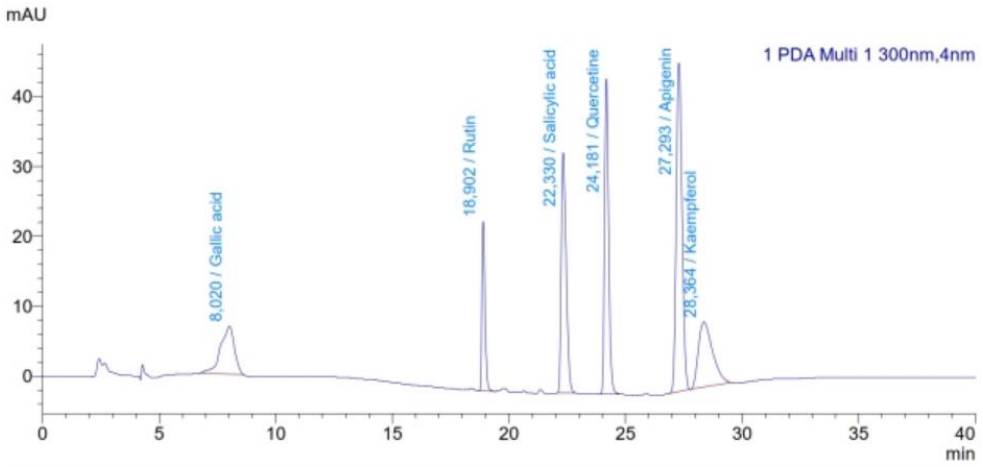

Figure 1. Chromatogram of standards at 300 nm.

In the HPLC–PDA standard chromatogram obtained at 300 nm, gallic acid, rutin, salicylic acid, quercetin, apigenin, and kaempferol were clearly separated. The good symmetry of the peaks and retention times indicate that the selected chromatographic conditions are suitable for the qualitative and quantitative determination of phenolic compounds.

Conclusion:

This study confirms that the leaves of turnip (Brassica rapa L) grown in Uzbekistan are sufficiently rich in phenolic compounds and vitamins. This indicates that its heart has biological and antioxidant value. Studying the chemical composition of the leaves of the turnip plant, obtaining a natural food supplement useful for human health from it and putting it into practice is important for the development of healthy

nutrition.

References

1.Comparison of glucosinolate profiles in different tissues of Bhandari SR, Jo JS, Li JG nine Brassica crops. Molecules. 2015;20:15827–15841. doi: 10.3390 / mollecules200915827. [DOI] [PMC free article] [PubMed] [Google Scholar

2.Zhu B., Liang Z., Zang Y., Zhu Z., Yang J. A wide variety of glucosinolates among Brassicaceae vegetables that are common in China. Hortic. Factory J. 2023;9:365–380. doi: 10.1016 / j.hpj.2022.08.006. [DOI] [Google Scholar

3.Comparative analysis of secondary metabolites in Park CH, Park SY, Park YJ, Kim JK, Park SU metabolite profile and Chinese cabbage, radish and hybrid xbrassicoraphanus. J. Agric. Food Chemistry. 2020;68:13711–13719. doi: 10.1021 / acs.jafc.0c04897. [DOI] [PubMed] [Google Scholar

4.Iahtisham Ul H., Han S., Awan KA, Iqbal MJ Sulforafan as a potential anti-cancer agent: a comprehensive mechanical examination. J. Food biochemistry. 2022; 46: e13886. doi: 10.1111 / jfbc.13886. [DOI] [PubMed] [Google Scholar

5.Felker P., Bunch R., Leung AM the concentration of thiocyanate and goitrin in human plasma, their precursor concentration in Brassica vegetables, and potential risk for hypothyroidism. Nutr. Revelation 2016; 74: 248-258. doi: 10.1093/nutrit / nov110. [DOI] [PMC free article] [PubMed] [Google Scholar

6.Del Bo ' C., Bernardi S., Marino M., Porrini M., Tucci M., Guglielmetti S., Cherubini A., Carrieri B., Kirkup B., Kroon P. etc. Polyphenol intake and systematic review of health outcomes: is there sufficient evidence to determine a polyphenol-rich diet that promotes health? Nutrients. 2019;11:1355. doi: 10.3390 / nu11061355. [DOI] [PMC free article] [PubMed] [Google Scholar

7.Bouslimi H., Ferreira R., Dridi N., Brito P., Martins-Dias S., Cador I., Sleimi N. The effect of barium stress on Brassica juncea and Cakile Maritima: the indicator role of some antioxidant enzymes and secondary metabolites . Fiton-Inter. J. Exp Bot. 2021;90:145–158. doi: 10.32604 / phyton.2020.011752. [DOI] [Google Scholar

8.Yang J, Lou J, Zhong W, Li Y, He Y, Su S, Chen X, Zhu B. Chemical Profile of Turnip According to the Plant Part and the Cultivar: A Multivariate Approach. Foods. 2023 Aug 24;12(17):3195. doi: 10.3390/foods12173195. PMID: 37685128; PMCID: PMC10486609.