

DETERMINATION OF BIOLOGICALLY ACTIVE COMPOUNDS IN EXTRACTS OF SOME PLANTS USING THE CHROMATOGRAPHIC METHOD

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Abstract. This article analyzes the extractive substances of *Eichhornia crassipes* and *Pistia stratiotes*, and determines the presence of biologically active substances, including vitamins V₁, V₂, V₃, PP, V₆, V₉, V₁₂, and C. Extracts of the roots, stems, and leaves of these plants were prepared separately, and their composition was analyzed using high-performance liquid chromatography (HPLC). The qualitative and quantitative characteristics of vitamins in the extracts of the aquatic plants *Eichhornia crassipes* and *Pistia stratiotes* were described.

Keywords: *eichhornia crassipes*, *Pistia stratiotes*, HPLC method, vitamins, extract, biologically active compounds.

Introduction It is known that there are many plants rich in biologically active substances, and the extracts of such plants have anti-inflammatory, antioxidant, antifungal, anticancer, hepatoprotective and antibacterial properties, as well as other biologically wide effects, such as insecticidal, allelopathic and larvicidal effects. The medicinal properties of many plants, their chemical composition have not been sufficiently studied. Among the medicinal plants, *Eichhornia crassipes*, *Pistia stratiotes* are aquatic plants, and the extracts of these aquatic plants contain vitamins, tannins, saponins, terpenoids, a number of metabolites, phenolic compounds, flavonoids.

Literature review

It is noted in the literature that aquatic plants such as “*Eichhornia crassipes*” and “*Pistia stratiotes*”, which have strong antimicrobial and antioxidant potential and biologically active phytochemicals, may be useful in developing alternative compounds for the treatment of infectious diseases caused by bacterial pathogens [1-4].

In view of this, this research work, which is aimed at studying the chemical composition of the extracts of aquatic plants “*Eichhornia crassipes*” and “*Pistia stratiotes*”, which are rich in vitamins, is one of the current problems in the field of bioorganic and pharmaceutical chemistry.

It is known that vitamins are organic substances with a diverse chemical structure, which are important for the vital activity of all living organisms. These compounds, which are required by the body in very small quantities (unlike proteins, fats and carbohydrates), are included in the composition of enzyme molecules and participate in the metabolic processes in tissues. The human and animal body obtains most vitamins only from plants and other food products. Therefore, the absence or deficiency of any vitamin in food products leads to metabolic disorders in the human or animal body, and subsequently to the development of serious diseases called avitaminosis and hypovitaminosis [5].

Vitamins are the main regulators of metabolism in *Eichhornia crassipes* and *Pistia stratiotes* plants (participate in the biosynthesis of enzymes). Vitamin C, carotene, catechins and flavonols are actively involved in the oxidation-reduction processes that constantly occur in plant tissues.

Under the influence of vitamins, plant productivity increases, maturation accelerates, and root development occurs rapidly.

It was found that the extract of *Eichhornia crassipes* and *Pistia stratiotes* aquatic plants contains many macroelements, including: calcium, magnesium, potassium, phosphorus and sulfur in large quantities in the roots, of which calcium accounts for the largest amount - 34.56%, aluminum - 17.63% and magnesium - 7.89%. The plant's leaves were also rich in calcium (69.21%), potassium (11.7%), and sodium (5.74%) and magnesium (6.87%), which are essential for the plant's normal life. When analyzing the elements in *Pistia stratiotes*, it was found that there are about 30 elements, some of which are essential for the plant's normal growth and development [6].

Table 1

Some physicochemical properties of vitamins

No	Vitamin abbreviation symbol	Chemical formula	Molecular mass g/mol	Liquidus temperature °C	Density g/cm ³	Boiling point °C	Solubility
1	C	C ₆ H ₈ O ₆	176,12	190-192	-	-	water, ethanol
2	B ₁	C ₁₂ H ₁₇ N ₄ O ₅ S	265,4	248-250	-	-	water,
3	B ₂	C ₁₇ H ₂₀ N ₄ O ₆	376,36	280	-	-	water, ethanol
4	B ₆	C ₈ H ₁₁ NO ₃	169,18	-	-	-	water,
5	B ₉	C ₁₉ H ₁₉ N ₇ O ₆	441,4	250°C (disintegration)	-	-	water,
6	B ₁₂	S ₆₃ R ₈₈ CoN ₁₄ O ₁₄ P	1355,38	300	-	300	water,
7	PP	C ₆ H ₅ NO ₂	123,109	123,109	1,47	237	water,

Research Methodology

During the research, distillation, extraction, filtration, as well as drying methods and pH-metry, chromatography methods were used.

Chromatography conditions:

Mobile phase (gradient method) – acetonitrile – buffer pH 2.92 (4% : 96%) 0-6 min., (10% : 90%) 6-9 min., (20% : 80%) 9-15., (4% : 96%) 15-20 min.

Injection volume – 10 µl.

Mobile phase speed – 0.75 mlG'min.

Column – Eclipse XDB – C18. 5.0 µm, 4.6x250mm.

Detector – diode array detector, detection wavelengths 272 nm, 292 nm, 254 nm, 297 nm and 360 nm.

For qualitative and quantitative determination of vitamins in *Eichhornia crassipes*, *Pistia stratiotes* plants, separate samples were extracted from roots, stems and leaves. Aqueous extracts were mixed in a magnetic stirrer (2x4 hours per day, at a temperature of 40°C). The extract was

filtered (filter holes diameter 0.45 μm). A BIOBASE MS7-H550-Pro (China) magnetic stirrer was used to mix aqueous extracts. The temperature of the extract (YET-610L) was controlled by an electronic thermometer, and the pH of the solutions was controlled by a pH meter (IONOMER-PXSJ-216F). The composition of the extract and the structure of vitamins were studied by the YuSSX method.

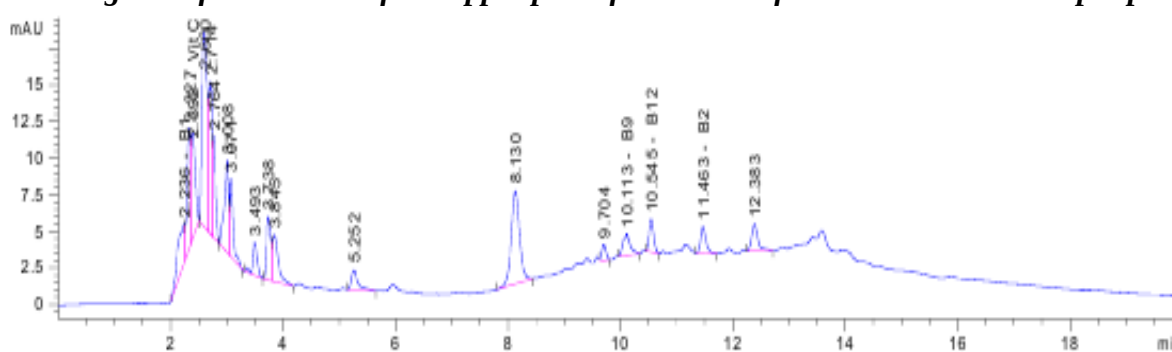
Analysis and results

Vitamins perform important biological functions in the human body, for example: Ascorbic acid Vitamin C is involved in the fight against infection in the human body, in improving vision, and in cell regeneration.

Therefore, we tried to determine the water-soluble vitamins in the composition based on the USSX method. For this, we identified the water-soluble vitamins standard samples C, B1, B2, B6, B9, B12, PP from the column retention times of 0.1 mg/ml concentrations. Below, Figures 1 and 2 show the chromatograms of vitamins isolated from the composition of *Eichhornia crassipes* and *Pistia stratiotes* plants.

Figure 1

Chromatogram of the extract of the upper part of the water of the *Eichhornia crassipes* plant



vegetative organs of both plants under study, of which V12 is mainly found in relatively high amounts in the roots of *Eichhornia crassipes*, while it is relatively high in the stem of *Pistia stratiotes*.

Table 1

Results of quantitative analysis of vitamins based on the YUSSX method

№	Name	Vitamin content mg/100g						
		B1	B2	B6	B9	B12	C	PP
1	<i>Eichhornia</i> root	-	92,941	-	5,293	98,497	-	81, 593
2	<i>Eichhornia</i> stem	27,062	12,134	-	13,100	13,189	34,294	31,648
3	<i>Pistachio</i> root	-	10,538	-	-	18,326	-	28,489
4	<i>Pistachio</i> leaf	20,521	64,060	49,409	13,023	157,16 7	27,881	33,212

Vitamin Riboflavin (B2) is involved in metabolism and blood formation in the human body. It facilitates the absorption of oxygen by cells, reduces eye fatigue. Pyridoxine (B6) Participates in the metabolism of amino acids and fats, controls the amount of cholesterol. Normalizes the functioning of the nervous system. Folic acid (B9) vitamin participates in the synthesis of nucleic and amino acids, controls the process of blood formation. Nicotinic acid (PP) vitamin participates in the synthesis of nucleic and amino acids, controls the work of blood formation organs [7]. Cyanocobalamin (B12) vitamin participates in increasing immunity and blood formation, normalizes blood pressure, and normalizes the nervous system [8]. In general, it can be observed that the content of water-soluble vitamins in both studied plants is higher than in other plants.

CONCLUSION

The qualitative and quantitative analysis of water-soluble vitamins such as C, B1, B2, B6, B9, B12, PP in the root, stem and flower of *Eichhornia crassipes* and *Pistia stratiotes* plants was investigated using the YuSSX method. It was found that the amount of water-soluble vitamins is relatively higher in the upper part of the water.

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