FLAVONOID PROFILE OF "AS-INFUSUM" AND ITS BIOLOGICAL ACTIVITY

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Abstract: This study investigates the flavonoid composition of the "As-Infusum" plant-based infusion using high-performance liquid chromatography (HPLC). The results demonstrated that rutin (39.12 mg/g) is the predominant component, determining the antioxidant and cardioprotective properties of the infusion. Additionally, flavonoids such as dihydroquercetin, rosavin, quercetin, and salidroside were identified, contributing to the biological activity and enhancing the pharmacological and nutraceutical potential of the infusion.

Keywords: As-Infusum, flavonoids, HPLC, rutin, antioxidant activity, nutraceutical potential.

"AS-INFUSUM"NING FLAVONOID PROFILI VA UNING BIOLOGIK FAOLLIGI

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Annotatsiya: Ushbu maqolada "As-Infusum" o'simlik damlamasi tarkibidagi flavonoidlar yuqori samarali suyuqlik xromatografiyasi (HPLC) usuli yordamida tahlil qilindi. Tadqiqot natijalariga ko'ra, rutin (39,12 mg/g) asosiy komponent sifatida aniqlanib, damlamaning antioksidant va kardioprotektiv xususiyatlarini belgilashi ilmiy asoslandi. Shuningdek, dihidrokversetin, rozavin, kversetin va salidrozid kabi flavonoidlar aniqlanib, damlamaning biologik faolligi hamda farmakologik va nutrasevtik salohiyatini oshirishi ko'rsatildi.

Kalit so'zlar: As-Infusum, flavonoidlar, HPLC, rutin, antioksidant faollik, nutrasevtik salohiyat.

ФЛАВОНОИДНЫЙ ПРОФИЛЬ «AS-INFUSUM» И ЕГО БИОЛОГИЧЕСКАЯ АКТИВНОСТЬ

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Аннотация: В данной работе исследован флавоноидный состав настоя «As-Infusum» методом высокоэффективной жидкостной хроматографии (ВЭЖХ). Установлено, что рутин (39,12 мг/г) является основным компонентом, определяющим антиоксидантные и кардиопротекторные свойства настоя. Также выявлены флавоноиды, такие как дигидрокверцетин, розавин, кверцетин и салидрозид, способствующие повышению биологической активности и усиливающие фармакологический и нутрицевтический потенциал настоя.

Ключевые слова: As-Infusum, флавоноиды, ВЭЖХ, рутин, антиоксидантная активность, нутрицевтический потенциал.

INTRODUCTION

Flavonoids represent one of the most abundant and biologically active classes of plant secondary metabolites, characterized by their antioxidant, anti-inflammatory, cardioprotective, hepatoprotective, and anticancer properties. These compounds play a crucial role in plant physiological processes, including defense mechanisms, photosynthesis, and responses to environmental stress. Moreover, flavonoids are of significant importance for human health, as their intake has been associated with the reduction of oxidative stress, enhancement of immune function, and regulation of metabolic processes. In pharmaceutical and nutraceutical applications, both the qualitative and quantitative composition of flavonoids, as well as their bioactive effects, serve as key indicators for evaluating the pharmacological potential of a product. Plant infusions and extracts are particularly rich in complex mixtures of bioactive compounds, where the concentration, ratio, and synergistic interactions of flavonoids determine their overall therapeutic efficacy. Therefore, the flavonoid profile of such preparations is considered a critical parameter for the scientific assessment of antioxidant capacity, anti-inflammatory activity, and other biological functions. Currently, high-performance liquid chromatography (HPLC) is regarded as one of the most reliable and effective analytical techniques for the identification and quantification of flavonoids. This method enables precise characterization of individual compounds and their distribution within complex mixtures. Furthermore, HPLC facilitates the evaluation of pharmacological activity, the investigation of bioactive compound profiles, and the scientific substantiation of their application in nutraceutical products [1-2].

From this perspective, the “As-Infusum” herbal infusion, prepared from Pyrus (pear shoots), Styphnolobium japonicum (Japanese sophora flower buds), and Matricaria (chamomile), represents a relevant object of study for the determination of its flavonoid profile and their quantitative characteristics. Such analysis is essential not only for the scientific substantiation of

the pharmacological and nutraceutical potential of this infusion, but also for ensuring quality control in the production of medicinal and nutraceutical products.

MATERIALS AND METHODS

The "As-Infusum" herbal infusion was selected as the object of this study. The infusion was prepared based on Pyrus (pear shoots), Styphnolobium japonicum (Japanese sophora flower buds), and Matricaria (chamomile). The aim of the study was to determine the flavonoid profile of the infusion and to investigate their quantitative characteristics.

Sample Preparation. Flavonoid extraction was carried out according to the following procedure: A 1.0 g sample was accurately weighed using an analytical balance and placed into a 300 mL flat-bottom flask. Subsequently, 50 mL of 70% ethanol solution was added. The mixture was subjected to intensive heating at 70 °C for 1 hour using a magnetic stirrer equipped with a reflux condenser to enhance extraction efficiency. After heating, the mixture was stirred at room temperature for 2 hours to ensure maximum transfer of flavonoids into the solvent phase. The obtained extract was then allowed to settle and filtered. To ensure complete extraction, the remaining residue was re-extracted twice with an additional 25 mL of 70% ethanol. The combined filtrates were adjusted to a final volume of 100 mL and centrifuged at 8000 rpm for 20 minutes. The supernatant was separated and used for subsequent analytical determination.

HPLC Analysis. Flavonoid identification and quantification were performed using a phosphate buffer-acetonitrile system, which represents a widely accepted standard approach in HPLC methodology for the analysis of flavonoids and related compounds. This system ensures the stability of flavonoid profiles and enables their accurate identification and quantification [4-5].

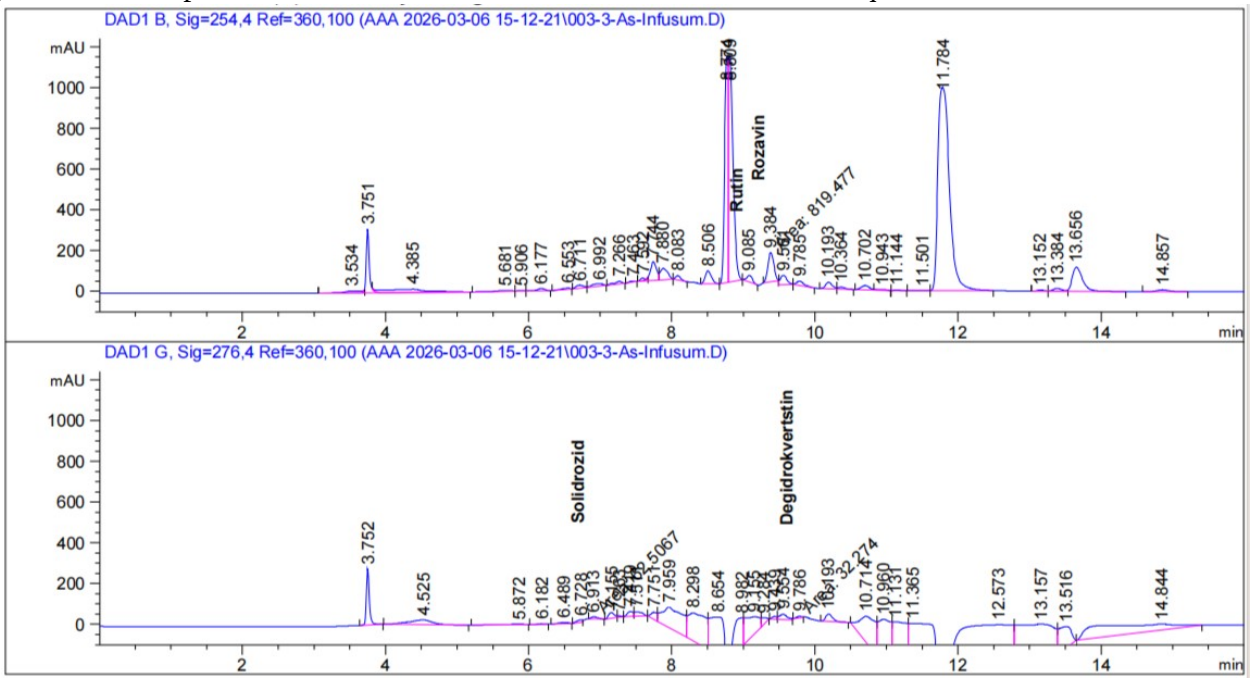

Figure 1. HPLC analysis of "As-Infusum" infusion

Chromatographic Conditions. Flavonoid analysis was performed under the following HPLC conditions:

Chromatograph: Agilent 1200 system equipped with an autosampler;

Column: Eclipse XDB C18 (reversed-phase), 5 µm, 4.6 × 250 mm;

Detector: Diode Array Detector (DAD) at 254 nm and 276 nm;

Flow rate: 0.8 mL/min;

Eluent (phosphate buffer : acetonitrile): 0-5 min - 95:5; 6-12 min - 70:30; 12-13 min - 50:50; 13-15 min - 95:5;

Column temperature: 30 °C;

Injection volume: 10 µL.

During the analysis, standard reference solutions were introduced into the HPLC system first, followed by the prepared sample solutions. This method enables accurate identification of individual flavonoid components and precise quantification of their concentrations [3].

RESULTS

The flavonoid composition of the "As-Infusum" infusion was determined using high-performance liquid chromatography (HPLC), revealing the presence of the following components (Table 1).

Table 1. Flavonoid composition of "As-Infusum" infusion

№	Flavonoid name	Concentration (mg/g)
1	Dihydroquercetin	5.68
2	Luteolin	0.06
3	Rutin	39.12
4	Quercetin	2.41
5	Salidroside	2.19
6	Rosavin	7.69

DISCUSSION

The results indicate that rutin is present at the highest concentration (39.12 mg/g), suggesting that it is the principal component responsible for the antioxidant and cardioprotective activity of the infusion. Additionally, dihydroquercetin (5.68 mg/g) and rosavin (7.69 mg/g) were identified in considerable amounts, contributing to the anti-inflammatory and protective properties of the preparation.

Other flavonoids, including quercetin (2.41 mg/g) and salidroside (2.19 mg/g), although present in lower concentrations, play an important role in complementing the pharmacological and biological activity profile of the infusion. Luteolin (0.06 mg/g) was detected at a minimal level; however, it may still contribute to the overall biological activity of the flavonoid spectrum.

Overall, the obtained results demonstrate that the high concentration and diversity of flavonoids contribute to the complex antioxidant, anti-inflammatory, and cardioprotective properties of the infusion. Furthermore, the broad flavonoid spectrum enhances the nutraceutical and medicinal potential of the preparation, supporting its possible application in pharmacological and dietary products. These findings scientifically confirm that the flavonoid composition plays a decisive role in determining the biological activity of plant infusions and serves as a key indicator in the evaluation of their bioactive component profile.

CONCLUSION

The "As-Infusum" infusion is rich in flavonoids, and its bioactive components significantly enhance its pharmacological and nutraceutical potential. Rutin was identified as the predominant compound (39.12 mg/g), playing a key role in determining the antioxidant and cardioprotective properties of the infusion.

In addition, dihydroquercetin (5.68 mg/g) and rosavin (7.69 mg/g) were present in considerable amounts, contributing to the anti-inflammatory and cytoprotective effects, thereby enriching the overall bioactive profile of the preparation. Flavonoids such as quercetin and salidroside provide synergistic biological effects, further enhancing the overall pharmacological potential of the infusion.

Moreover, the complex spectrum of flavonoids supports the scientific justification of "As-Infusum" as a medicinal and nutraceutical product and confirms its prospects for pharmacological applications.

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