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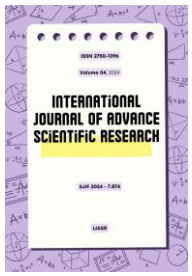

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Research Article

DETERMINATION OF THE AMOUNT OF FLAVONOIDS IN THE FOOD SUPPLEMENT "PSORALIN"

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Abstract

This study presents the results of determining the flavonoid content in the food supplement "Psoralin." The objective was to quantify the flavonoid compounds using modern analytical techniques, such as spectrophotometry and chromatography. The analysis was conducted in accordance with established regulatory standards for evaluating the quality and safety of food supplements. The findings reveal that the flavonoid content in "Psoralin" aligns with the recommended levels, highlighting its potential health benefits and compliance with safety standards. This research underscores the importance of assessing bioactive compounds in dietary supplements to ensure their efficacy and consumer safety.

Keywords

Food supplement, psoralin, flavonoids, quantitative analysis, spectrophotometry, chromatography, bioactive compounds.

Introduction

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It has been established that plants, along with flavonoids, contain nitrogen-fixing substances – urea derivatives. Plant flavonoids are prescribed to people for rapid fatigue and weakness, stress, and any injuries, especially those accompanied by bleeding, capillary fragility, problems with blood pressure, circulatory disorders, and inflammatory diseases of the stomach and intestines. Currently, science knows more than 6,500 types of flavonoids. The most important of them are dehydroquercetin, rutin, and quercetin, which play an important role in managing physiological processes in the human body [1; 1271-1278-b].

Flavonoids are widely distributed in plants and are what give the flowers and fruits of many plants their vibrant colours [3],[4]. They also play an important role in protecting plants from microbial and insect attacks. More importantly, consuming foods containing flavonoids has been linked to numerous health benefits. Although research suggests that flavonoids themselves provide minimal antioxidant effects due to their slow absorption by the body, there is evidence that they biologically trigger the production of natural enzymes that fight disease [2],[3].

We studied the flavonoid content of the food supplement "Psoralin" using modern physicochemical methods. The following method was used to qualitatively and quantitatively determine the flavonoid content of dry and finely ground food supplement "Psoralin".

EXPERIMENTAL PART

Reagents: The following reagents were used for spectrophotometric analysis: sample extract, rutin, gallic acid, and quercetin.

Solutions: The following solutions were used for spectrophotometric analysis: 96% ethyl alcohol, and aqueous extracts of psoralin in a mass ratio of 1:10.

Instruments: spectrophotometry, graduated measuring cup (glass, micropipette), 50-100 cm3 beakers, simple filter paper, glass funnel, and 250 cm3 flask were used to determine the amount of flavonoids in the food additive "Psoralin".

Ethyl alcohol 96% was used as a solvent for extracting the substances to be determined from the composition of "Psoralin". For this purpose, the sample and alcohol were mixed in a ratio of 1:10 and extracted using a magnetic stirrer for 75 minutes at a temperature of 30°C. 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 column (USA) as a stationary phase. For this purpose, a 0.5% acetic acid solution was prepared in a ratio of 35:65 and standard solutions in acetonitrile of different concentrations: 0.025 mg/ml and 0.05 mg/ml, the flow rate was 1 ml/min, the thermostat temperature was 400°C, the volume of the injected sample was 10 µl, and a calibration curve was plotted. Based on the standard samples, 2.5 min of gallic acid, 3.6 min of rutin, and 16 min of quercetin were obtained on an HPLC apparatus (LC 2030 C 3D Plus Shimadzu Japan).

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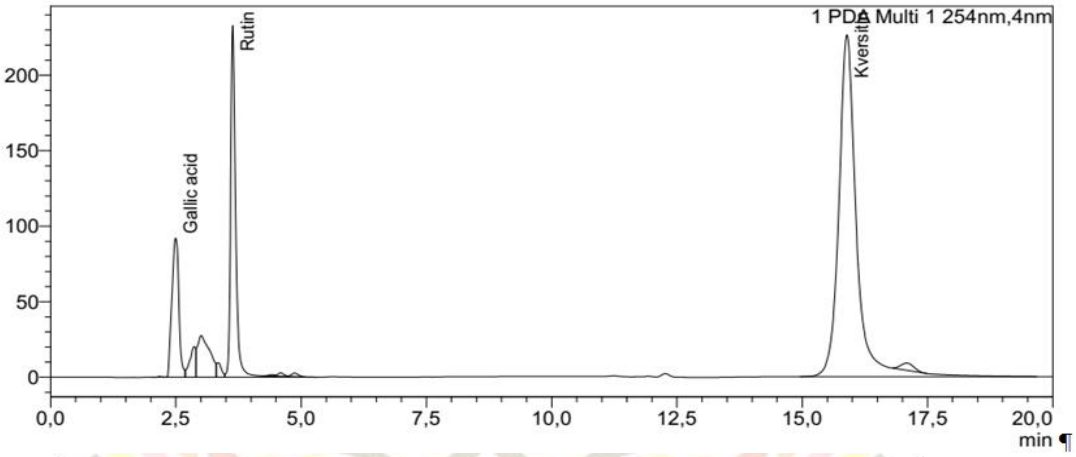

Figure 1. Chromatogram of flavonoids in the extract.

From the standard samples, we see that the chromatogram was obtained in the gradient mode shown after 12 min, at a flow rate of 0.75 ml/min. The gallic acid in our extract reached a peak after 2.5 minutes, rutin after 3.6 minutes, and quercetin after -16 minutes, based on the determined gradients.

The following table shows the concentrations of flavonoids and their standard solutions adopted as standards for high-performance liquid chromatography.

Table 1.Standard samples were taken as a standard for high-performance liquid chromatography and their concentrations.

Peak	Time	Area	Height	Cons.	Unit	Symbol	Name
2	2,493	898349	92205	0,050	mg/ml	V	Gallic acid
6	3,635	1616320	232739	0,050	mg/ml	SV	Rutin
10	15, 891	5600155	226403	0,050	mg/ml	S	Quercetin
Summary		8115424	551347				

The above table shows the concentrations of standard solutions of gallic acid, rutin and quercetin taken as samples for the determination of the flavonoid content of the food supplement "Psoralin" by high-performance liquid chromatography.

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Table 2. The following table lists the detection values for the analysis

Time	C phase % 0.5% solution of acetic acid in water	B phase % Acetonitrile
1	60	40
3	70	30
6	55	45
10	80	20
12	Holding	

Relationship between the stationary phase and solvents in TLC analysis.

When analyzing apigenin and kaempferol, based on the above-mentioned instrument parameters, a chromatogram was obtained in the following gradient mode after 12 minutes at a flow rate of 0.75 ml/min:

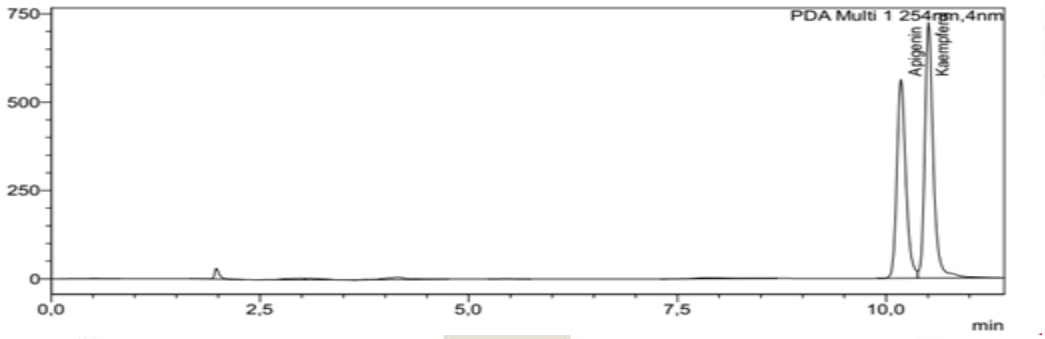

Figure 2. Chromatogram of reference flavonoids.

The chromatogram above shows the TLC results of apigenin and kaempferol. Apigenin gave corresponding peaks at 10.2 min and kaempferol at 10.5 min.

Table 3. Concentrations of apigenin and kaempferol obtained by high-performance liquid chromatography.

Peak number	Time	Area	Height	Concentration	Unit	Symbol	Name

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12	10,009	840882	59608	0,025	mg/ml	V	апигенин
14	10,509	108680	13963	0,003	mg/ml	V	кемпферол
Summary		949563	73571				

As can be seen from Table 3, the food additive "Psoralin" when determining the content of flavonoids using high-performance liquid chromatography found that the concentration of kaempferol was 0.003 mg/ml compared to apigenin. Also, the amount of flavonoids determined in the extracted food additive "Psoralin" is presented in the table below.

Table 4. The amount of flavonoids determined in the food additive Psoralin.

Sample name	Analysed compounds in the sample				
“Psoralin”	Галловая кислота	Рутин	Кверцитин	Апигенин	Каэмпферол
	0,223	0,029	0	0,025	0,003

As can be seen from Table 4, when studying the qualitative and quantitative content of flavonoids contained in the dried and finely ground sample of the food additive "Psoralin", a high content of gallic acid was established by the method of high-performance liquid chromatography. The following was found: gallic acid - 22.3 mg%, rutin - 2.9 mg%, apigenin - 2.5 mg% and kaempferol - 0.3 mg%, quercetin was not detected.

Conclusion

When checking the qualitative and quantitative composition of flavonoids contained in the food additive "Psoralin", the method of high-performance liquid chromatography established that the content of gallic acid is the highest. Experimental results of detection spectrophotometry, HPLC (LC 2030 C 3D Plus Shimadzu Japan) were obtained. Gallic acid - 22.3 mg%, rutin - 2.9 mg%, apigenin - 2.5 mg% and kaempferol - 0.3 mg% were detected, but quercetin was not detected.

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