UDC: 615.322.074.7.8

STUDY OF FLAVONOIDS IN LEAVES OF THORNY LOCUST

***Romanova S. V.*[1], *Duchenko M.A.*[2], *Volochay V. I.*[1], *Kozyra S.A.*[1]**
[1]National Pharmaceutical University, Kharkiv, Ukraine
[2]Vinnytsia National Medical University named after M.I. Pyrohov, Vinnytsia, Ukraine

Relevance. One of the promising sources of herbal remedies are medicinal plants containing flavonoids, which, due to their wide distribution in plants and their great structural diversity, are currently in the focus of attention of researchers in the field of pharmacognosy, pharmacy, and medicine [2,3]. Flavonoids are the most numerous class of natural phenolic compounds, which are characterized by structural diversity, high and diverse activity, and low toxicity. A wide amplitude of the biological activity of flavonoids is associated with the diversity of their chemical structures and the various physicochemical properties resulting from them. This interest is connected with the fact that flavonoids, being evolutionarily adequate to the human body, cause antioxidant, angioprotective, hepatoprotective, choleretic, diuretic, neurotropic and other important pharmacological properties [2,3,5]. Thus, it is the above mentioned pharmacological effects that most attract scientists in the field of creating new herbal medicines.

However, the creation of drugs on the basis of flavonoid plants is hampered by the lack of study of their chemical composition, dependencies in a series of "chemical structure - spectral characteristics" and "component composition - pharmacological properties". This leads to the absence of a systematic approach in the treatment of the aggregate importance of active substances in terms of manifestation of pharmacological effects, as well as scientifically grounded technologies for the production and analysis of drugs. In addition, the problem of objective standardization of raw materials of medicinal plants and herbal preparations containing flavonoids is currently acute, since in many cases the methods of analysis lack evidence base or modern instrumental capabilities are not being used [2,5]. The object of searching for flavonoids in this work were the leaves of the thorny locust. The chemical composition, the diversity of biological activity, the presence of a sufficient raw material base give grounds for a detailed study of this raw material.

The purpose. Determination of the qualitative composition and quantitative content of flavonoids in the leaves of thorny locust.

Materials and methods of research. With the help of qualitative reactions and methods of paper chromatography, the composition of flavonoids in the leaves locust was studied, and spectrophotometry was used to study their number.

The results of the study. Aqueous and alcohol-aqueous (50% ethanol) extracts from the raw material were prepared for qualitative analysis of flavonoids. Qualitative reactions were carried out: with iron (III) chloride (on phenol hydroxyl) - red-brown staining; cyanidine Bryant test (for aglycones) - pink staining; reaction with alkali (substances of phenolic nature) bright yellow staining [4]. Also, the qualitative composition of flavonoids in the objects was studied by the method of one- and two-dimensional

paper chromatography in solvent systems: n-butanol-acetic acid-water (4:1:2) - I direction and 15% acetic acid - II direction. According to the nature of fluorescence in visible and UV light before and after treatment with ammonia vapors and staining after treatment with chromogenic reagents (alkali solutions, aluminum salts), taking into account chromatographic mobility, up to 13 substances of phenolic nature have been revealed on the chromatographs. 9 substances of them had dark or yellow staining in UV light and changed it to intense yellow, orange or yellow-green under the action of ammonia vapors, were attributed to flavonoids [3,4].

Quantitative determination of flavonoids in the raw material was carried out according to a modified procedure given in the monograph on St. John's wort [1]: 1.0 g (exact load) of the grounded dry raw material was placed in a flask with a 150 ml capacity, 30 ml of 70% ethanol were added. The flask was weighed, connected to a reflux condenser and heated in a water bath for 2 hours. After cooling, the flask was weighed, the mass loss was offset by 70% ethanol, and infused for 1 hour to achieve balanced concentration.

The extract was filtered through a dry paper filter (solution A). To a 50 ml volumetric flask 1 ml of solution A was placed, 1 ml of 2% aluminum chloride solution in 96% ethanol was added and the volume of the solution with 96% ethanol was brought to the mark (test solution). In 40 min. the optical density of the solution was measured on a SF-46 spectrophotometer at a wavelength of 410 nm in a cell with a layer thickness of 10 mm. As the comparison solution, a solution consisting of 1 ml of solution A, 1 drop of acetic acid diluted and brought with 96% ethanol to the mark in a 50 ml volumetric flask, was used. In parallel, the optical density of a solution of the Pharmacopoeia standard sample (FSO) of rutin, which was prepared in a similar manner to the test solution, was measured [4]. The amount of flavonoids, in terms of routine, in percent, was calculated by the formula:

$$X = \frac{A \cdot m_0 \cdot 30 \cdot 50 \cdot 100 \cdot 100}{A_0 \cdot m \cdot 100 \cdot (100 - W)}, \text{ in which}$$

A – the optical density of the test solution;

A_0 – the optical density of the complex of the FSO solution of rutin with aluminum chloride;

m – raw material load, g;

m_0 – load of FSO rutin, g;

W – mass loss on drying, %.

The results of statistical processing of the content of flavonoids in the leaves of thorny locust are shown in the table.

Table. The quantitative content of flavonoids in the leaves of gledichia prickly

m	n	X_i	$X_{ср}$	S^2	$S_{ср}$	P	t(P, n)	Кількісний вміст, %	$\varepsilon_{ср}$, %
5	4	2,73	2,75	0,00037	0,0086	0,95	2,78	2,75±0,02	1,87
		2,78							
		2,74							
		2,76							
		2,75							

Conclusions. At least 13 substances of phenolic nature, including 9 flavonoids, were found in the spines of the thorny locust. The content of flavonoids in the raw material was determined by spectrophotometry. The results of studies show that the leaves of the thorny locust are a promising raw material for further study and creation of medicines on its basis.

References

1. Государственная фармакопея СССР : Вып. 2. Общие методы анализа. Лекарственное растительное сырье / МЗ СССР. – 11 – е изд., доп. – М. : Медицина, 1990. – 400 с.
2. Куркин В.А., Поройков В.В., Куркина А.В., Авдеева Е.В., Правдивцева О.Е. Флавоноиды лекарственных растений: прогноз антиоксидантной активности // Современные проблемы науки и образования. – 2015. – № 2. – С. 197-201.
3. Куркин В.А., Куркина А.В., Авдеева Е.В. Флавоноиды как биологически активные соединения лекарственных растений // Фундаментальные исследования. – 2013. – № 11-9. – С. 1897-1901.
4. Романова С.В, Ковальов С.В. Кількісне визначення фенольних сполук Lens culinaris // Вісник фармації. – 2009. – №2(38). – С. 24-26.
5. Flavonoids: Chemistry, Biochemistry, and Applications / Edited by Qvind M. Andersen and Kenneth R. Markham. – Boca Raton; London; New York: CRC Press Taylor & Francis Group, 2006. – 1197 p.