



**STUDY OF FLAVONOIDS OF THE HERBAL DRUG “TILIAE FLORES”**

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**Introduction:** Linden flowers are pharmacopoeial medicinal plant raw materials. It is widely used in clinical practice for the treatment and prevention of many common diseases. In the form of various medicinal forms it is used as a diaphoretic and expectorant.

The pharmacological properties of linden flower preparations are due to the various groups of biologically active compounds (BAC): essential oil, polysaccharides and flavonoids.



Linden flowers PM.2.5.0024.15

small-leaved lime      big-leaf linden

**Authenticity:**

- 1) TLC (rutin and caffeic acid)
- 2) Qualitative reaction (polysaccharides)

**Quantitation:**

the amount of reducing sugars (in the composition of polysaccharides) in terms of glucose – not less than 2% (SP 470 nm)

**Relevance:** Flavonoids are very important group of biologically active compounds because of their properties. They have the ability to increase the strength of capillary walls (P-vitamin activity) due to the antioxidant effect, which is important in the treatment of chronic venous insufficiency, hypertension and other cardiovascular diseases associated with increased permeability of blood capillaries.

Despite the high degree of scientific knowledge of linden flowers, the improvement of approaches to standardization remains an urgent issue.

**Aim of the Study:** In this study, we aimed to analyze the composition of flavonoids in linden flowers samples.

**Research objectives.**

1. Collect information and conduct an analytical study of the chemical composition of linden flowers.
2. Determine flavonoids in linden flowers using modern methods in industrial samples.
3. Determine marker compounds used to identify medicinal products.
4. Draw a conclusion about the need to supplement or develop sections of regulatory documentation (RD).

**The object of the study:** samples of crushed linden flowers, packaged in cardboard packs and produced by firm "Krasnogorskleksredstva".

The samples were purchased from pharmacy chains in Moscow and the Moscow Region in 2022.



**Materials and Methods:** ultra-high-performance liquid chromatography with photodiode array and tandem quadrupole mass-selective detection in the gradient elution mode was used to analyze flavonoids in industrial samples of linden flowers.

Extraction was performed with 70% aqueous methanol in a water bath.

Parameter	Characteristic
Liquid chromatograph	Waters Acquity
Solvent feed rate	0,25 ml/min
Detector	Diode array UV detector and tandem quadrupole MS detector TQD (Waters)
Wavelength range	$\lambda=220-500$ nm

Column	Acuity UPLC BEH with a particle size of 1.7 $\mu$ m (silica gel C18)
Column length	150 mm
Column diameter	2,1 mm
Column temperature	35°C
Injection size	2 $\mu$ l и 5 $\mu$ l

Mobile phase A	Formic acid with a mixture of water - acetonitrile (95 : 5)
Mobile phase B	Formic acid with acetonitrile
Sample preparation	Extraction with seventy percent methylic alcohol in an ultrasonic bath

Time, min	Mobile phase A, %	Mobile phase B, %
0	95	5
30	50	50
32	0	100
33	95	5
36	95	5

**Results:** The presence of flavonoids characteristic for linden flowers was confirmed. 13 flavonoids were identified: quercetin-3-rutinosid-7-rhamnoside, quercetin-3-glucoside-7-rhamnoside, tiliroside, rutin, quercetin-3-glucoside, kaempferitrin, kaempferol 3-rutinosid, quercetin-3-arabinoside, astragaline, quercetin 3-rhamnoside, kaempferol 7-rhamnoside, quercetin 3-glucuronide, prunetin-4'-rutinosid.

**Conclusion:** A flavonoid profile was identified and it is consistent with literature data. When standardizing linden flowers and medicinal herbal preparations based on them, it is recommended to use quercetin and kaempferol derivatives as marker compounds. These compounds are specific and the inclusion of a definition of this group of biologically active compounds in the RD to confirm authenticity seems very relevant when standardizing linden flowers.