

PHYTOCHEMICAL STUDY OF THALLI PARMELIA

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Introduction. The biologically active substances of *Parmelia* are known to have a broad variety of pharmacological activity. They exhibit antimicrobial (including vs. *Mycobacterium tuberculosis*), antifungal, antiviral, anti-inflammatory, analgesic, antipyretic, anti-proliferative, hypolipidemic, hepatoprotective, antioxidant, hemolytic, and cytotoxic activity. *Parmelia* species have been used in diarrhoea, dyspepsia, spermatorrhoea, amenorrhoea, dysentery and as wound healer.

S. A. Begalinova proved high clinical effectiveness of *Parmelia* in the complex treatment of eczema compared with conventional treatment.

According to S. E. Badmaeva, the biologically active substances of this lichen exhibited protective anti-ulcer effect, increasing the resistance of the gastric mucosa to the action of such ulcerogenic factors such as stress and ethanol.

Parmelia is included in the complex herbal preparation «Speman» manufactured by Himalaya Drug Company (India), which is used for the treatment of benign prostatic hyperplasia and prostatitis.

The chemical composition of this lichen has been insufficiently studied. It is believed that *Parmelia* shows its action due to the presence of such lichen substances, as usnic, stictic, norstictic, protocetraric, fumarprotocetraric, salazinic, consalazinic, alectoronic, caperatic, divaricatic, lobaric, atraric acid and atranorin.

Carbohydrates present in *Parmelia* constitute the major part of its dry matter. Most of the carbohydrates are presented by homopolysaccharides, similar in composition to the cellulose – lichenin (which is also called lichen starch) and isolichenin. They are a typical constituent of cell membranes of the mycobiont hyphae. Macromolecule of lichenin was established by A. F. Mazurova by Fourier-IR spectroscopy. It consists of glucose residues, connected by glycoside (acetal) bond in β position (1 \rightarrow 3) (1 \rightarrow 4) in the ratio 1:3. Mono-, disaccharides (glucose, mannose, galactose, fructose, xylose, ribose, sucrose) and polyols (mannitol, sorbitol, arabitol, volamitol, ribitol) are present in small quantities.

Chitin (a characteristic of most fungi), and nitrogen-containing substances – amino acids (alanine, aspartic acid, glutamic acid, valine, lysine, tyrosine, tryptophan) were found in *Parmelia* hyphae. Such enzymes as invertase, catalase, urease, zymase, lichenase were found in *Thalli Parmelia*.

Phycobiont of this lichen produces vitamins, in particular ascorbic acid, biotin, cyanocobalamin, and nicotinic acid.

Parmelia contains phenolic compounds such as flavonoids and compounds, similar by nature to plant tannins, yet with a simpler structure.

As for fatty substances, lichesterol, arabinitol, ergosterol, α -tocopherol, β -sitosterol, nonacosane, oleic, linoleic, linolenic, palmitic and stearic acid were identified in Parmelia.

Lichens have a unique ability to absorb and accumulate various chemical elements in their raw material from the environment that affects their biochemical composition. Thus, ash-like Parmelia substance are presented Si, S, P, Na, Cl, Al, Ba, Ca, Cu, Fe, Cr, K, Mg, Mn, Sn, Ti, Pb, Ag.

Aim. The aim of our study was the phytochemical study Parmelia thalli.

Materials and methods. All experiments were performed according to the methods of the State Pharmacopoeia of Ukraine.

The content of extractive substances was determined by the gravimetric method in the ratio raw material-extragent 1:50. Purified water and 40%, 50%, 60%, 70% ethyl alcohol were used as extragents for the determination of extractives in the investigated raw materials.

Quantitative determination of the sum of free organic acids was carried out by titrimetric method. 0.1 M sodium hydroxide solution was used as the titrant.

The total hydroxycinnamic acids content was determined on the spectrophotometer Optizen POP (Korea) at a wavelength of 327 nanometers.

Quantitative analysis of the amount of water-soluble polysaccharides in Parmelia Thalli was determined by the gravimetric method.

Results and discussion. It is established that the weight loss on drying is 6.87%, total ash – 20.98%.

The content of extractive substances extracted with 40% ethanol, was 16.35%, 50% – 13.90%, 60% – 12.39%, 70% – 13.70% and water is at 25.94%. The results of the experiment showed that the best extragent for this raw material was purified water.

The total content of free organic acids in terms of malic acid in Parmelia Thalli was 2.09%, the total content of hydroxycinnamic acids in terms of chlorogenic acid – 1.36%.

The study determined that the content of water-soluble polysaccharides was 10.95%.

Conclusions. Concerning the importance of the chemical composition of Parmelia, drugs in the form of dry powder, aqueous or alcoholic tinctures etc. based on the raw material of the members of this genus can be worked out.

The obtained experimental data can be used in the development of the relevant sections of quality control methods for the Parmelia Thalli.