

Phytochemical study of three species of genus *Verbascum* growing in Georgian flora

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Plants of the family *Scrophulariaceae*, in particular the genus *Verbascum* L. are widely distributed in the wild flora of Georgia. Various species of *Verbascum* have long used in traditional medicine and homeopathic practice as emollients, expectorants and analgesics for acute respiratory infections. Decoctions have anthelmintic, diuretic and at neurosis - sedative effects.

Reports have appeared in the last years that their decoctions exhibit activity against flu A₂ and B viruses. The leading compound of all *Verbascum* species possesses neuroprotective activity at primary diabetic encephalopathy and also protects human skin cells from photoaging caused by ultraviolet irradiation. All these factors have led to the in-depth study of three families of this genus plants.

According to many researches we have established that the species *V. phlomoides* L., *V. thapsus* L., and *V. densiflorum* Bertol. contain a broad spectrum of biologically active compounds such as flavonoids, steroids, saponins, carbohydrates, phenylcarboxylic and fatty acids, and vitamins.

All three plants were collected at the flowering stage near Tbilisi (Georgia). Air-dried raw materials from aerial parts together with inflorescences (500 g each) were exhaustively extracted with 50% MeOH by 60 °C. United spirit fractions filtered and concentrated until full removal of alcohol. Thickened aqueous phase treated with ether to remove chlorophyll and lipophilic substances.

Purified aqueous concentrate was chromatographed on alumina (Al₂O₃) to isolate phenolic compounds, but for their fractionation phenolic amount was chromatographed on a polyamide column. Eluent used a mixture of H₂O-MeOH with increasing gradient of alcohol concentration (0-100%). Fractions controlled by TLC, sorbent - Silufol UV-254, system : CHCl₃-MeOH-H₂O - 70:23.5:2. As a result, allocated two phenolic (non-flavonoid) compounds 1 and 2:

- 1 - β-(3,4-dihydroxyphenyl)-ethyl-O-α-L-rhamnopyranosyl-(1→3)-β-D-(4-O-cofeoyl)-glucopyranoside (verbascoside);
- 2 - β-hydroxy-β-(3,4-dihydroxyphenyl)-ethyl-O-α-L-rhamnopyranosyl-(1→2)-β-D-(4-O-cofeoyl)-glucopyranoside (orobanchoside).

After separation of the phenolic compounds, obtained fractions were combined and concentrated, dissolved in a small amount of methanol and precipitated with acetone. The precipitate was removed. Ethanol-acetone solution was concentrated and cooled in the refrigerator. The precipitate was represented by the sum of iridoids 3 (aucubin), 4 (catalpol), 5 (aucubin 6-O-β-D-xylopyranosid), and 6 [catalpol 6-O-(2"-O-trans-p-coumaroyl)-α-L-rhamnopyranosid, or saccatoside].

Separation of iridoid amounts was carried out first on column with the polyamide (system EtAc-CHCl₃-MeOH-H₂O - 7:2:1:1), and then with silica gel (system CHCl₃-EtOH - 25:1).

The identification of individual compound was carried out by chemical transformations and by means of determination of melting points, rotation angles, the analysis of UV-, IR, MS-, ¹H- and ¹³C-NMR spectra, and comparing with the literary data.

We have isolated these six compounds from the above-named plants the first time.

Biotechnology in Medicine

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Biotechnology is related with the handling of biological systems. The ancient use of biotechnology is documented as early as 6000 BC when people manipulated the native properties of plants, microorganisms, and animals to produce goods for their use. Over the past few decades, use of medical biotechnology has led to important advances in diagnostics and therapy. As a result, many diseases can now be detected earlier and treated more specifically than ever before, it has extend its wings into different fields of health and medicine especially in pharmacogenomics, improvement of effective and cheaper subunit vaccine (recombinant vaccines) screening, diagnosis of inherited diseases. Therefore, new technologies and approaches are required to handle the ever-increasing data generated by genomic projects. Bioinformatics is an example of this that combines the principles and concepts of computer science and biology. The public perceptions and doubts about the abuse of biotechnology are there as the advanced knowledge in biotechnology can be used in biological warfare. However, future of the biotechnology is clear and it will surely see important strides that will be used for study and product development.