# AN ESTIMATION OF THE AUTHENTICITY OF A HERBAL EXTRACTAS A BAA RAW MATERIAL SCUTELLARIA BAICALENSIS GEORGI

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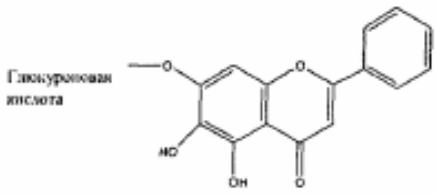
Skullcap is a perennial herbaceous plant (Lamiaceae family) with a small rhizome and fleshy taproot, a four-sided, slightly lowered stem, opposite leaves and violet bilobate flowers gathered in a one-sided, clustering inflorescence. It flowers in June-August and the fruit ripen in August-September.

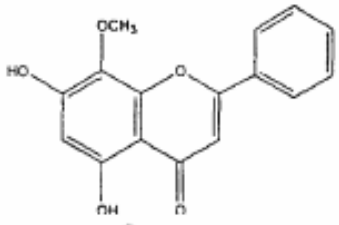
It grows in an area bordered by the Amur basin and Lake Khanka (North-West China and North-West Mongolia). In Russia it grows in eastern Siberia, the far east, theAmur region and Primurye, and extensively in the steppes of eastern Zabaikaliye. Skullcap can be cropped only in Chitinskaya Region territory. The intensive use of virgin lands in steppes of Zabaikalye has reduced natural sources of skullcap.

Skullcap is a well-known plant in traditional Oriental medicine in which all parts of the plant are used including the roots and aerial parts. In Tibetan, Chinese and Korean medicine skullcap is used as a sedative and anti-inflammatory component in tea and decoctions. In Mongolia this plant was considered a general tonic and restorative which increases the body's resistance.

It is considered that skullcap derives its health-giving properties from flavonoids, the high content of which gives skullcap's roots their yellow colour.




Байкалин




Вогонин

The chemical structure of skullcap flavones is quite varied – chrysin, apigenin, luteolin, skutellarein, dinatin, isoskutellarein (isoscutellarein), vagonin, wogonin, baikalein, neobaikalein, oroxylin, etc. In total there are more than 20 different compounds. However, baikalein is the predominant flavone aglycon in skullcap root, and it is found in the form of baikalin, its 7-O-glucuronid. The usual skullcap root extraction method by hot water produces an extract with a baikalin content of about

26%, and the compound with the second highest concentration is vagonin glucuronid, the content of which can be up to 10%.

Pharmacological research has confirmed skullcap's hypotensive and sedative properties, which are very useful in the treatment of cardiovascular neurosis and some functional disorders of the nervous system, as well as the low toxicity of skullcap preparations.

Skullcap flavones possess characteristic P-vitamin properties, i.e. blood vessel strengthening and antioxidant action, improvement of cerebral blood circulation, and baikalin also possesses antiviral and anti-inflammatory properties.

As a result of all these factors, skullcap root extract has become a popular and widespread component of many biologically active food additives.

To identify the main active flavonoids of Baikal skullcap the most commonly used method is HPLC, both isocratic elution and gradient elution. Mixtures of acetonitrile-water or methanol-water with added phosphoric, acetic or trichloroacetic acid are used as the mobile phase; detection under UV-light is at wave-length 320-380 nm.

The content of Baikalin, this being the main flavone in skullcap root, is the prefered indicator in the standardization and quality control of skullcap root extracts, BAA and herbal raw material.

We used the HPLC method to identify the content of baikalin (fig.1): fixed phase – the Phenomenex Luna column 5u C18 (2), 250×4,6 mm; mobile phase - methanol-1% water solution of trichloroacetic acid (56:44); flow rate - 1,0 ml/min; detection - spectrophotometric detector at wave-length 320 nm. Under these conditions the baikalin detection limit was 10 mg/kg.

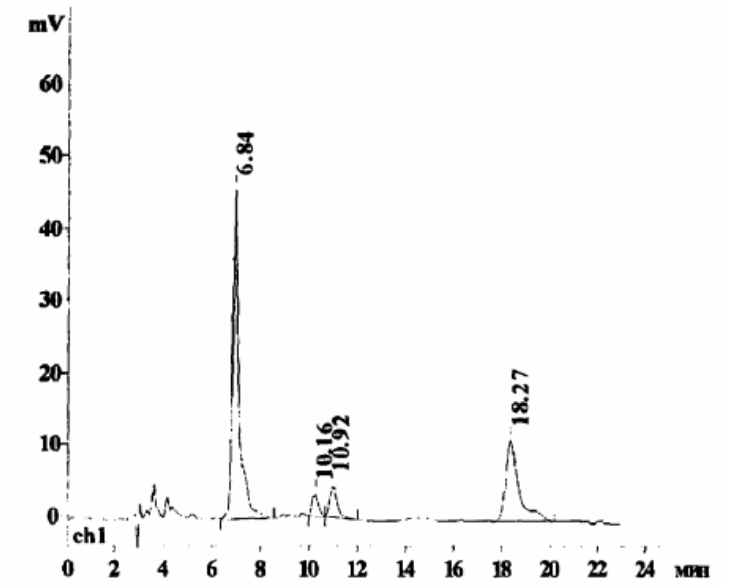



**Fig.1. HPLC- chromatogram of a sample of Baikal skullcap root extract where baikalin holding time was 6,84 min.**

The described analysis method allows us not only to identify skullcap extracts according to their active substance content, but also to determine their content in the raw material both in the finished product and at different production stages.

In present-day biologically active food additives, the use of enriched skullcap extracts with a baikalin content of up to 80-90% is recommended. This allows us to reduce the BAA dose to one tablet or capsule per day and to use a precise dosage of the biologically active component (flavones).

Samples of Baikal skullcap BAA and raw material for BAA production have been analyzed by means of the above mentioned HPLC method at the State University of RAMS Nutrition Research Institute. The results are presented in table 1.

**Table 1.**

**HPLC analysis results of products containing Baikal skullcap**

| № | Sample name | Form | Declared content | Baikalin content |
|---|---|---|---|---|
| 1 | Dry skullcap extract-1 | Raw material | | 89% |
| 2 | Dry skullcap extract-2 | Raw material | | 86% |
| 3 | Dry skullcap extract-3 | Raw material | | 90% |
| 4 | Dry skullcap extract-3 | Raw material | | 0,5% |
| 5 | Dry skullcap extract-3 | Raw material | | 15,5% |
| 6 | BAA - №1 | Drops | | 0,02% (0,2 mg/ml) |
| 7 | BAA - №2 | Drops | | 0,18% (1,8 mg/ml) |
| 8 | BAA - №3 | Capsules | 100 mg skullcap extract/caps. | 40,2 mg/caps. |
| 9 | BAA - №4 | Syrup | | 40,2 mg/100 ml |
| 10 | Dry tea drink | Dry infusion | 100% ground Baikal skullcap root | 6,2% |
| 11 | BAA - №5 | Capsules | 5 mg of skullcap extract (90% baikalin) | 4,4 mg/caps. |
| 12 | BAA - №6 | Capsules | Skullcap herb | 0,26 mg/caps. |
| 13 | BAA - №7 | Capsules | Skullcap herb | 0,18 mg/caps. |

The content of baikalin in the dried skullcap roots is about 6% (sample 10), therefore skullcap extract with a baikalin content of less that 6% (sample 4 with baikalin content 0,5%) can be considered a low-quality product for BAA production.

The low baikalin content in the aerial parts of skullcap does not recommend it as a replacement raw material for skullcap root in BAA production (samples 12, 13). The use of enriched skullcap root extract with an active substance content of approximately 85-90%, extracted using innovative techniques, allows production of BAA products with a standardized content of the active component (samples 8, 9, 11).