

COMPOSITION OF THE AERIAL PART OF *Scutellaria baicalensis*

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Scutellaria baicalensis Georgi (Lamiaceae) is a medicinal plant that is used broadly in Tibetan medicine [1]. The composition of phenolic compounds from its roots were studied previously [2]. Information on the composition of the aerial part of *S. baicalensis* is scarce. Chrysin, apigenin, scutellarein, isoscutellarein, and luteolin derivatives are known to be present [2, 3]. Herein we present results from a study of the composition of fatty acids, amino acids, phenolic acids, and macro- and microelements from the aerial part of *S. baicalensis*.

The aerial part of *S. baicalensis* was collected during flowering in Chita District (Russia). The composition of fatty acids was determined after isolation and methylation [4] on an Agilent GC—MS (MS detector, PH-Innowax column, 30 m/250 μ m/0.50 μ m, temperature gradient 150-250°C, heating rate 2°C/min). The total lipid content (gravimetry after Folch extraction [4]) in organs of *S. baicalensis* was 1.59-1.87%. The group composition of fatty acids for all organs was typical. Unsaturated compounds dominated by 1.2-1.5 times (Table 1). There were 11 saturated fatty acids, the dominant one being palmitic acid. The content of saturated components in the various organs varied insignificantly. However, margaric and stearic acids accumulated most in leaves; lauric, myristic, and arachic acids, in flowers. Linoleic and linolenic acids dominated the unsaturated acids in all organs. Gondoic acid was not detected in stems; certain 16:1 acids, in leaves.

TABLE 1. Composition of Fatty Acids and Lipid Fractions from *S. baicalensis*, Mass % of Lipid Fraction

Acid	<i>S. baicalensis</i>			
	leaves	stems	flowers	aerial part
12:0	0.06	0.08	0.34	0.09
14:0	0.56	1.07	1.39	0.97
15:0	0.17	0.22	0.66	0.17
16:0	23.92	23.71	20.66	23.85
17:0	1.49	0.91	1.01	0.84
18:0	7.13	5.71	6.39	5.87
20:0	3.18	2.01	3.48	3.01
21:0	0.77	0.31	0.42	0.53
22:0	3.19	2.13	5.60	3.98
23:0	1.43	1.78	2.26	1.92
24:0	3.52	2.00	3.35	3.55
Σ_{sat}	45.42	39.93	45.56	44.78
16:1n-11	-	0.30	0.49	0.20
16:1n-9	-	0.34	0.60	0.27
16:1n-7	0.45	1.54	1.04	1.10
18:1n-9	7.82	5.11	4.89	5.61
18:1n-7	0.77	0.54	1.10	0.61
20:1n-9	0.31	-	0.35	0.25
22:1n-9	1.29	0.62	0.48	1.00
18:2n-6	24.88	16.25	21.75	19.88
18:3n-3	19.05	35.40	23.74	26.20
Σ_{unsat}	54.61	60.06	54.43	55.12
Total lipid content, %	1.79	1.87	1.59	1.83

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TABLE 2. Elemental Composition of Aerial Part of *S. baicalensis*, Mass % of Abs. Dry Raw Material

Element	Content	Element	Content	Element	Content
Ag	$0.90 \cdot 10^{-5}$	Li	$0.27 \cdot 10^{-3}$	Si	0.18
Al	0.14	Mg	0.90	Sn	$0.27 \cdot 10^{-4}$
Ba	$0.90 \cdot 10^{-2}$	Mn	$1.80 \cdot 10^{-2}$	Ti	$2.72 \cdot 10^{-2}$
Be	$0.90 \cdot 10^{-5}$	Mo	$0.36 \cdot 10^{-4}$	V	$0.92 \cdot 10^{-4}$
Ca	0.91	Na	0.14	Y	$9.05 \cdot 10^{-4}$
Cr	$0.91 \cdot 10^{-4}$	Nb	$0.27 \cdot 10^{-3}$	Zn	$2.71 \cdot 10^{-3}$
Cu	$0.92 \cdot 10^{-3}$	Ni	$0.05 \cdot 10^{-3}$	Zr	$0.90 \cdot 10^{-3}$
Fe	$2.71 \cdot 10^{-2}$	P	0.14		
La	$0.36 \cdot 10^{-3}$	Pb	$0.93 \cdot 10^{-4}$		

Amino acids were determined after extraction by the literature method [5] on an AAA-339 automated amino-acid analyzer. Free amino acids contained 14 compounds (mass % of abs. dry raw material): alanine (0.11), asparagine (0.56), cysteine (0.12), glutamine (0.14), glutamic acid (0.04), glycine (0.42), isoleucine (0.09), methionine (0.15), proline (2.01), serine (0.01), threonine (0.03), valine (0.03), γ -aminobutyric acid (0.05), and phosphoethanolamine (0.10).

HPLC [Gliston liquid chromatograph with Rheodyne-7125 manual injector, Platinum EPS C-18 100 A column (4.6×250 mm), MeOH:H₂O:H₃PO₄ (400:600:5) mobile phase, eluent flow rate 0.5 mL/min, Gliston UV/VIS UV detector (λ 254 nm)] identified in the alcohol extract (70% ethanol) of the aerial part of *S. baicalensis* four phenolic acids (mass % of abs. dry raw material): caffeic (1.34), chlorogenic (1.93), rosmarinic (0.88), and ferulic (0.87).

A total of 25 elements (Table 2) were found in the raw material (DFS-8 spectrograph). With respect to terrestrial elements [6], the aerial part of *S. baicalensis* is considered a moderate accumulator of Al, Ba, Cr, Cu, Fe, Mn, and V, with Fe and Mn superconcentrated.

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