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THE CHEMICAL COMPOSITIONS OF SOME KAZAKHSTAN GLASSWORTS

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We have conducted the first investigation of the phytochemical composition of the following plants of the Chenopodiaceae family: *Halocnemum strobilaceum*, *Suaeda physophora*, and *Kalidium caspicum* [1].

The air-dry raw material was extracted successively with benzene, cold water, aqueous ethanol, hot water, solutions of ammonium oxalate and oxalic acid, and a 0.5% solution of caustic soda. The following classes of compounds were found in these glassworts: carbohydrates, amino acids, coumarins, phenolic acids, flavonoid compounds, tanning substances, polysaccharides, pectin substances, and hemicelluloses [2].

The ascorbic acid contents were determined for the raw materials of *H. strobilaceum* — 0.3% — and *S. physophora* — 0.07% [4]. Phenolic acid compositions were determined: *H. strobilaceum* contained vanillic and isovanillic acids; *S. physophora* protoacatechuic and caffeic acids; and *K. caspicum* vanillic and protocatechuic acids. The complete amino acid compositions of these plants were determined on a Hitachi 835 amino acid analyzer (Japan) [3], and their microelement compositions were studied (Tables 2 and 3).

The results obtained show that the glasswort plants investigated are promising for obtaining biologically active complexes.

TABLE 1. Quantitative Characteristics of the Plants, %

Index	H. strobilaceum	S. physophora	K. caspium
Moisture content	4.8	2.2	3.8
Extractive substances	31.0	31.0	30.8
Amino acids	6.4	1.2	1.8
Carbohydrates	6.7	15	16
Flavonoids	1.2	1.7	1.6

TABLE 2. Amino Acid Compositions, %

Amino acid	H. strobilaceum	S. physophora	K. caspicum
Alanine	0.170	0.140	0.102
Glycine	0.090	0.070	0.046
Valine	0.030	0.010	0.004
Leucine	0.020	0.035	0.015
Asparagine	0.040	0.020	0.055
Cysteine	0.050	0.090	0.103
Tryptophan	0.082	0.009	0.005
Ornithine	0.041	0.035	0.033
Lysine	0.045	0.032	0.051
Arginine	0.052	0.040	0.020
Histidine	0.041	0.008	0.004
Glutamine	0.034	0.015	0.014

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TABLE 3. Microelement Compositions of Aqueous Extracts, %

Microelement	H. strobilaceum	S. physophora	K. caspicum
Cd	0.0002	0.00009	0.0001
Pb	0.0001	0.001	0.012
Ni	0.0001	0.0004	0.0009
Ca	0.01	0.46	0.01
Cu	0.010	0.009	0.001
Fe	0.01	0.3511	0.11
Co	0.005	0.0005	0.007
Mg	0.004	0.15	0.12
Mn	0.0033	0.0167	0.027
Zn	0.025	0.0129	0.0049
Na	3.5	0.46	4.3
K	0.46	2.92	0.67

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