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*G. E. AZIMBAEVA, M. S. ABDIKERIM,
B. M. IZTELEU, K. S. SMAILOVA, A. K. KAMYSBAEVA*

Kazakh National women's teacher training university,
Almaty, Republic of Kazakhstan

STUDY OF THE AMINO ACID AND ELEMENTAL COMPOSITION OF THE ABOVEGROUND PART OF XANTHIUM STRUMARIUM PLANTS

Abstract. The article contains materials on the study of the content of amino acids, macro- and microelements in the leaves and stems of *Xanthium strumarium* plants.

The content of amino acids is determined by liquid chromatographic method. As a result, 10 amino acids (2 essential): arginine, threonine, alanine, proline, cysteine, licin, phenylalanine, lysine, oxypoline, serine, and the presence of 10 elements in them was noted. It was determined that the dry extract from the aboveground part of *Xanthium strumarium* is a source of amino acids, macro- and microelements.

Key words: *Xanthium strumarium*, elemental composition, amino acids, leaves, stem.

Introduction. Medicinal plants are an important source of plant raw materials in the medical industry [1,2]. In the twentieth century, medicinal plants accounted for 80% of all active substances, and later they significantly displace synthetic, antibiotic, hormonal, etc. However, despite the outstanding achievements in the production of synthetic drugs, herbal medicines still occupy an important place in modern scientific medicine.

According to the world health organization (who), medicinal plants are the best source for single – use, individual medicines. Therefore, the interest in studying the composition and mechanism of action of biologically active compounds in medicinal plants is natural [3,4]. In this regard, the little-studied plant is of interest as a raw material for the production of herbal preparations in the field of Oncology *Xanthium strumarium*.

Xanthium strumarium Asteraceae Dumort (Compositae) belongs to the complex family. There are about 25 species of the relative *Xanthium strumarium*. In addition to the Northern regions, weeds grow all over the world. The plant is native to Europe, Asia and North America, including Africa, Australia, South America, India, China, Indonesia and Malaysia. Plants can be found on water, sandy soil, near reservoirs, ravines, roads, and on desert lands. There are 2 species on the territory of Kazakhstan, the most common (especially in the southern regions) are *Xanthium strumarium* and *Xanthium spinosum* [5,6].

Amino acids are the building material from which proteins necessary for the human body are built; they are biogenetic precursors of a large group of valuable biologically active substances: alkaloids, flavanoids, etc. Macro- and microelements in plants accumulate in the most favorable ratio for the human body and are mainly combined with various biopolymers (proteins, amino acids, vitamins, etc.), i.e. in an accessible and digestible form. Therefore, there is an interest in studying new additional plant sources to expand the range of already used ones [7,8].

RESEARCH MATERIALS AND METHODS

The above-ground part (leaves, stem) of *Xanthium strumarium* plants of the Medeu mountain region, collected in November 2018, dried to an air-dry state, was used as objects of research. The dynamics of accumulation of amino acids and elements were studied in the upper parts-leaves, stem. Numerical indicators of amino acid content were determined by liquid chromatographic method with a Shimadzu LC 20AD, SPD 20A detector. The elemental composition was determined by atomic absorption method using the Shimadzu "AA 7000" spectrophotometer[9].

RESULTS AND DISCUSSION

The results of the study of the amino acid composition are presented in table 1.

Table 1 – Amino acid content of the ground part of *Xanthium strumarium* plants, g/kg [10, 11]

№	The content of amino acids	The leaves of <i>Xanthium strumarium</i>	The stem of <i>Xanthium strumarium</i>	Sum of essential amino acids	Total content
1	Arginine	0,53	–	–	0,53
2	Threonine	1,55	1,65	–	3,2
3	Alanine	1,48	–	–	1,48
4	Proline	1,78	7,87	–	9,65
5	Cysteine	4,17	4,42	–	8,59
6	Licin	9,41	46,03	–	55,44
7	Phenylalanine *	49,93	49,87	99,80	
8	Lysine *	9,84	4,34	14,18	
9	Oxyproline	–	0,85	–	0,85
10	Serine	–	1,11	–	1,11
*Essential amino acid.					

The presence of 10 amino acids has been established, 2 of which are irreplaceable. The maximum accumulation of amino acids is observed in the leaves.

The sum of essential amino acids is from 9.84 to 49.93 g/kg, the sum of all amino acids is 0.53-49.93 g/kg, which reflects the biological value of the research objects.

It was found that the leaves and stem of the plant do not differ in the qualitative composition of elements. The accumulation of the same macro- and microelements was observed for all organs.

Evaluating the results of determining the elemental composition of table 2, we can note the following: the leaves have a high potassium content of 1.07 mg/kg.

Table 2 – Elemental composition in leaves and stems of *Xanthium strumarium*, mg/kg

Raw's	Cu	Zn	Mn	Fe	Co	Cd	Pb	Ni	Cr	K
The leaves of <i>Xanthium strumarium</i>	0,15	0,15	2,04	3,27	0,13	0,07	0,11	0,90	0,43	0,46
The stem of <i>Xanthium strumarium</i>	0,30	0,16	3,85	3,16	0,29	0,10	0,07	1,22	0,32	1,07

When studying the trace element composition, it was found that the maximum Mn content was observed in leaves and stems 2.04-3.85 mg/kg, iron 3.16-3.27 mg/kg, Cu and Zn 0.15-0.30 mg/kg and 0.15-0.16 mg/kg respectively.

The elements contained in the plant differ in the degree of extraction from the raw material, so we can note a number of elements contained in the dry extract from the above-ground part in significant quantities: Mn, Fe, Ni, Cr, K, and the content of which is less than in the raw material: Cu, Zn, Co, Cd, Pb. The content of toxic elements does not exceed the permissible standards (SanPiN 2.33.2.1078-01 (SanPiN 2.3.2.1280-03) for plant-based dietary supplements).

Conclusion. The analysis performed to identify the chemical composition of the aboveground part of *Xanthium strumarium* plants showed the presence of 10 amino acids, 2 of which are essential. According to the total content of amino acids, the leading position is occupied in the leaves of *Xanthium strumarium*.

The maximum content of macro and microelements is recorded in the leaves of *Xanthium strumarium*.

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Резюме

Г. Е. Азимбаева, М. С. Әбдікерім, Б. М. Изтелеу, К. С. Смаилова, А. К. Камысбаева

ХАНТНИУМ STRUMARIUM ӨСІМДІГІ ЖЕР ҮСТІ БӨЛІГІНІҢ АМИН ҚЫШҚЫЛДЫҚ ЖӘНЕ ЭЛЕМЕНТТІК ҚҰРАМЫН ЗЕРТТЕУ

Мақалада *Xanthium strumarium* өсімдіктерінің жапырақтары мен сабақтарындағы аминқышқылдарының, макро- және микроэлементтердің құрамын зерттеу бойынша материалдар келтірілген.

Амин қышқылдарының құрамы сұйық хроматографиялық әдіспен анықталған. Нәтижесінде 10 аминқышқыл (2 алмастырылмайтын) анықталды: аргинин, треонин, аланин, пролин, цистеин, лицин, фенилаланин, лизин, оксипролин, серин, сондай-ақ оларда 10 элементтің бар екендігі байқалды. *Xanthium strumarium* өсімдігінің жерүсті бөлігінің құрғақ сығындысы аминқышқылдардың, макро- және микроэлементтердің көзі болып табылады.

Түйін сөздер: *Xanthium strumarium*, элементтік құрамы, амин қышқылдары, жапырақтары, сабақтары.

Резюме

Г. Е. Азимбаева, М. С. Әбдікерім, Б. М. Изтелеу, К. С. Смаилова, А. К. Камысбаева

ИЗУЧЕНИЕ АМИНОКИСЛОТНОГО И ЭЛЕМЕНТНОГО СОСТАВА НАДЗЕМНОЙ ЧАСТИ РАСТЕНИЙ ХАНТНИУМ STRUMARIUM

В статье приведены материалы по изучению содержания аминокислот, макро- и микроэлементов в листьях и стеблях растений *Xanthium strumarium*.

Содержание аминокислот определено жидким хроматографическим методом. В результате выявлено 10 аминокислот (2 незаменимые): аргинин, треонин, аланин, пролин, цистеин, лицин, фенилаланин, лизин, оксипролин, серин, а также отмечено наличие в них 10-ти элементов. Определили, что сухой экстракт из надземной части *Xanthium strumarium* является источником аминокислот, макро- и микроэлементов.

Ключевые слова: *Xanthium strumarium*, элементный состав, аминокислоты, листья, стебель.