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Research of the amino acid composition of *Agrimonia eupatoria*

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Abstract
The purpose of our research work was to conduct a qualitative and quantitative investigation of amino acids in the herb of *Agrimonia eupatoria*. The qualitative amino acid composition of *Agrimonia eupatoria* was determined for the first time using an amino acid analyzer AAA T-339 M (CZ) in accordance with DSTU (State Standard of Ukraine) ISO 13903:2005. As a result of the research, 17 amino acids and their respective amounts were identified in the herb of *Agrimonia eupatoria*. From a quantitative point of view the following amino acids prevail: aspartic acid, glycine (0.93% each), alanine, valine (0.69% each), and lysine (0.53%).

Keywords: *Agrimonia eupatoria*, amino acids, primary synthesis substances.

1. Introduction
Therapeutic efficiency of plants is caused by a range of biologically active substances that vary in chemical composition and pharmacological properties. Their pharmacological activeness also depends on primary biosynthesis substances such as amino acids. In medicine, amino acids are used for the treatment of digestive and neuropsychiatric disorders, as well as for the prevention of atherosclerosis. Research findings prove their effect on nervous regulation processes and vascular tone [1, 2]. All this makes the investigation of the qualitative and quantitative amino acid composition of plants topical.
Agrimonia eupatoria – a perennial herbaceous plant, abundant throughout Ukraine, has enormous potential for research. *Agrimonia eupatoria* medicines stimulate the appetite, improve digestive secretions, exhibit choler etic and hemostatic actions. In non-traditional medicine, the plant is used as a cure for stomach problems, gallstone disease, insufficient urinary excretion and urinary incontinence, and inflammation of the mucous membrane of the mouth [3, 4]. The herb of *Agrimonia eupatoria* contains different groups of biologically active substances, but its amino acid composition has not been researched yet.
The **purpose** of this research paper is to conduct a qualitative and quantitative investigation of amino acids in the herb of *Agrimonia eupatoria*.

2. Materials and Methods.
The subject of research was herb of *Agrimonia eupatoria* harvested during the flowering period in Ivano-Frankivsk region.
Analysis was done in comparison with amino acid hydro lysate standards in accordance with DSTU (State Standard of Ukraine) ISO 13903:2005. In order to determine the amino acid composition of the protein, a small portion of the raw material (100 mg) dried at 60 ^{o}C was put in a hydrolysis tube and treated with 5 ml of purified water. Then the same amount of concentrated hydrochloric acid was added. The hydrolysis was carried out at a temperature of 120 ^{0}C during 15 minutes. After that the sample was neutralized with dry sodium hydroxide to pH = 11 and transferred into a porcelain cup for one hour to accelerate ammonia evaporation. Then hydrochloric acid solution was added to the sample to reduce pH to pH = 2.2. After filtration, 0.1-0.5 ml of the sample liquid were extracted and adjusted to 2 ml with a buffer solution of pH = 2.2. The analysis was done on an amino acid analyzer AAA T-339 M (CZ) using a loop 50 µL [5].

3. Results and Discussion
17 amino acids were identified in the examined sample of the raw material of *Agrimonia eupatoria* herb. 9 of them are essential amino acids. From a quantitative point of view the following ones prevail: aspartic acid, glycine, alanine, valine, and lysine. Quantitative content

of amino acids amount goes up to 7.62 mg per 100 mg of the raw material.

Research findings on the qualitative and quantitative amino acid composition of *Agrimonia eupatoria* are presented in the Table.

Table: Amino Acid Content of *Agrimonia eupatoria* Herb

#	Substance	General formula	Content, mg/100 mg of the raw material	#	Substance	General formula	Content, mg/100 mg of the raw material
1	Aspartic acid	$C_4H_6O_4N$	0.93	10	Methionine	$C_5H_{10}O_2NS$	0.31
2	Threonine	$C_4H_9O_2N$	0.39	11	Isoleucine	$C_6H_{13}O_2N$	0.46
3	Serine	$C_3H_7O_3N$	0.62	12	Leucine	$C_6H_{13}O_2N$	0.46
4	Glutamic acid	$C_5H_8O_4N$	0.15	13	Tyrosine	$C_9H_{13}O_3N$	0.23
5	Proline	$C_5H_9O_2N$	0.47	14	Phenylalanine	$C_9H_{12}O_2N$	0.33
6	Cysteine	$C_6H_{12}N_2O_4S_2$	0.08	15	Histidine	$C_6H_{11}O_2N_3$	0.23
7	Glycine	$C_2H_5O_2N$	0.93	16	Lysine	$C_6H_{13}O_2N_2$	0.53
8	Alanine	$C_3H_7O_2N$	0.69	17	Arginine	$C_6H_{15}O_2N_4$	0.15
9	Valine	$C_5H_{11}O_2N$	0.69				

4. Conclusions

1. The qualitative amino acid composition of *Agrimonia eupatoria* was determined for the first time using an amino acid analyzer AAA T-339 M (CZ) in accordance with DSTU (State Standard of Ukraine) ISO 13903:2005.
2. As a result of the research, 17 amino acids and their respective amounts were identified in the herb of *Agrimonia eupatoria*.
3. From a quantitative point of view the following amino acids prevail: aspartic acid, glycine (0.93% each), alanine, valine (0.69% each), and lysine (0.53%).

5. References

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