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Research on the Amino Acid Composition of "Hyposedaf" Dry Extract and its Antihypertensive Properties.

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Annotation: This study focuses on the amino acid composition of "Hyposedaf" dry extract, known for its antihypertensive properties. Utilizing high-performance liquid chromatography (HPLC), we quantitatively analyzed the amino acids present in the extract.
Our findings reveal that "Hyposedaf" contains 20 types of amino acids, including 10 essential ones. The total amino acids are composed of 46.5% essential and 53.5% non-essential amino acids. Predominant amino acids include histidine, cysteine, tyrosine, methionine, valine, asparagine, and leucine, collectively comprising 29.15 mg of amino acids. The study underscores the high nutritional value of "Hyposedaf" dry extract, highlighting its potential use in medical applications and pharmaceutical development.

Keywords: Dry extract, Amino acids, HPLC method, Essential and non-essential amino acids.

1. Introduction

Numerous studies have highlighted the vital role of minerals and amino acids within the human body. These elements are integral to various nutrients and are crucial in synthesizing all body proteins. Additionally, amino acids significantly contribute to brain functions such as intellectual activities, motivation, and overall mental well-being, thereby maintaining our vitality. They are indispensable in synthesizing all proteins in our organism.

Furthermore, amino acids are key components in the chemical structure of all human tissues, including muscles. Their unique pharmacological effects, coupled with their ability to synergize with a variety of substances, make them instrumental in creating multifunctional drugs from plant sources. Notably, macro and microelements, along with plant-derived amino acids, are more efficiently assimilated by the human body due to their presence in natural, "biological" quantities in plants. These amino acids also facilitate the normal functioning of mineral substances within the body. Therefore, the amino acid and mineral content in medicinal plants and phytopreparations are critical in developing new pharmaceuticals [1].

Bioelements in plant compositions are structured to be readily assimilated by the human body. These include amino acids, vitamins, proteins, and others, existing in a complex and interrelated form.

Given these insights, our study focuses on analyzing the amino acid composition of various medicinal plant raw materials and their extracts.

Amino acids play a pivotal role in plant development. They emerge during photosynthesis in plant organisms and participate in a broad spectrum of biochemical reactions that promote optimal growth and development [2,3,4].

Purpose of the Study: The purpose of this research is to study the amino acid composition of the "Hyposedaf" dry extract.

Experimental Section: The focus of our research was the "Hyposedaf" dry extract, a product named for its composition derived from plant materials known for their antihypertensive properties. The ingredients include Peppermint leaves (Folia Menthae piperitae L.), Turkistan motherwort (Herba Leonuri turkistanicae), Sanguine Hawthorn fruits (Fructus Crataegi sanguineae Pall), and Field Horsetail (Herba Equiseti arvensis). This extract complies with the standards set by the State Pharmacopoeia of the Republic of Uzbekistan and the XIV edition of the State Pharmacopoeia of the Russian Federation [5,6].

In our study, we analyzed the amino acid composition of the "Giposedaf" dry extract. The first step involved the separation of free amino acids, which was then followed by their quantitative analysis. This process entailed comparing the retention times and peak areas of a standard sample with those derived from the phenylthiocarbamide derivatives of the amino acids under examination.

2. Results and Discussion

In the study of the amino acid composition of the dry extract, initially, free amino acids were separated. For this purpose, 1 ml of 20% trichloroacetic acid was added to 1 ml (exact volume) of the test sample. After 10 minutes, the precipitate was separated by centrifugation at a speed of 8000 revolutions per minute for 15 minutes. After separating 0.1 ml of clear liquid, it was freeze-dried. The hydrolyzate was evaporated, and the dry residue was dissolved in a mixture of triethylamine-acetonitrile-water (1:7:1) and then dried. The phenylthioisocyanate reaction was used to obtain the phenylthiocarbamyl (FTC) derivatives of amino acids, following the method of Steven A. and Koen Daniel. The identification of amino acid derivatives was carried out by HPLC. An Agilent Technologies 1200 HPLC column detector of 75x4.6 mm was used, with solvent A: 0.14M CH3COONa + 0.05% ТЭА pH 6.4, B: CH3CN, flow rate 1.2 ml/min, and absorption at 269 nm. The gradient %/min was as follows: 1-6%/0-2.5 min; 6-30%/2.51-40 min; 30-60%/40.1-45 min; 60-60%/45.1-50 min; 60-0%/50.1-55 min [7].

The chromatograms of standard amino acids and those in the “Hyposedaf” dry extract are presented in Figures 1 and 2.

The quantitative composition of amino acids, as well as their chemical classification, is shown in Table 1.

The data in Table 1 indicates that the “Hyposedaf” dry extract contains 20 amino acids, of which 10 are essential amino acids. This composition signifies the high pharmacological value of the dry extract. The total amount of amino acids is 29.151 µg/g, with essential amino acids constituting 15.605 µg/g and the remaining 15.605 µg/g consisting of non-essential amino acids.

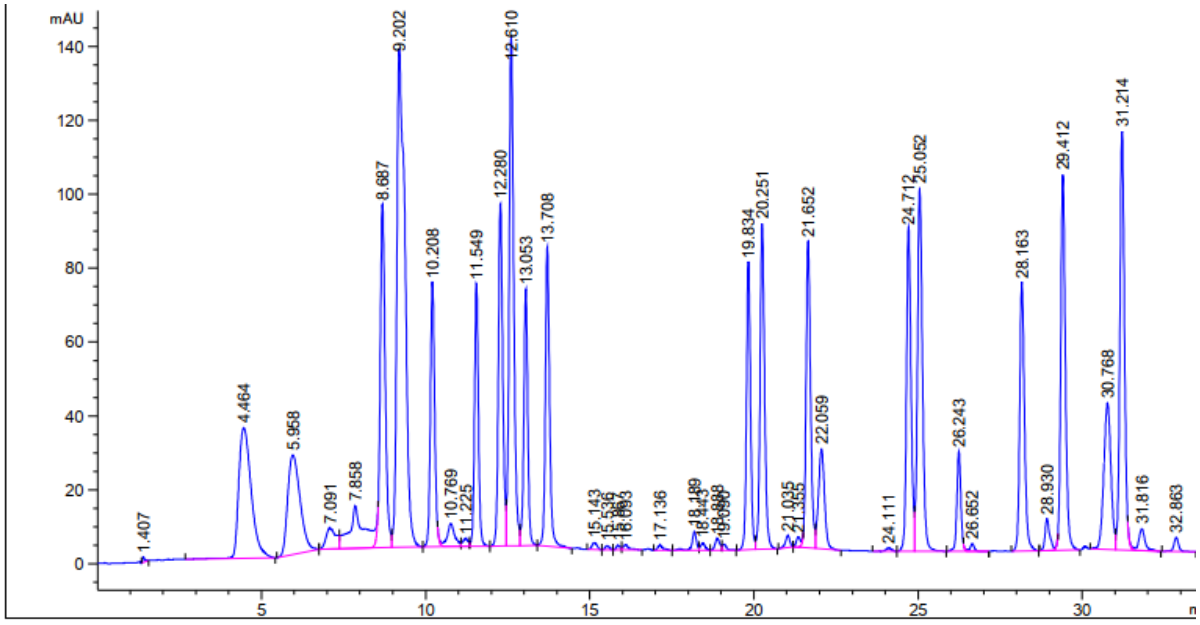

Figure 1. Chromatogram of the standard sample of the amino acid mixture.

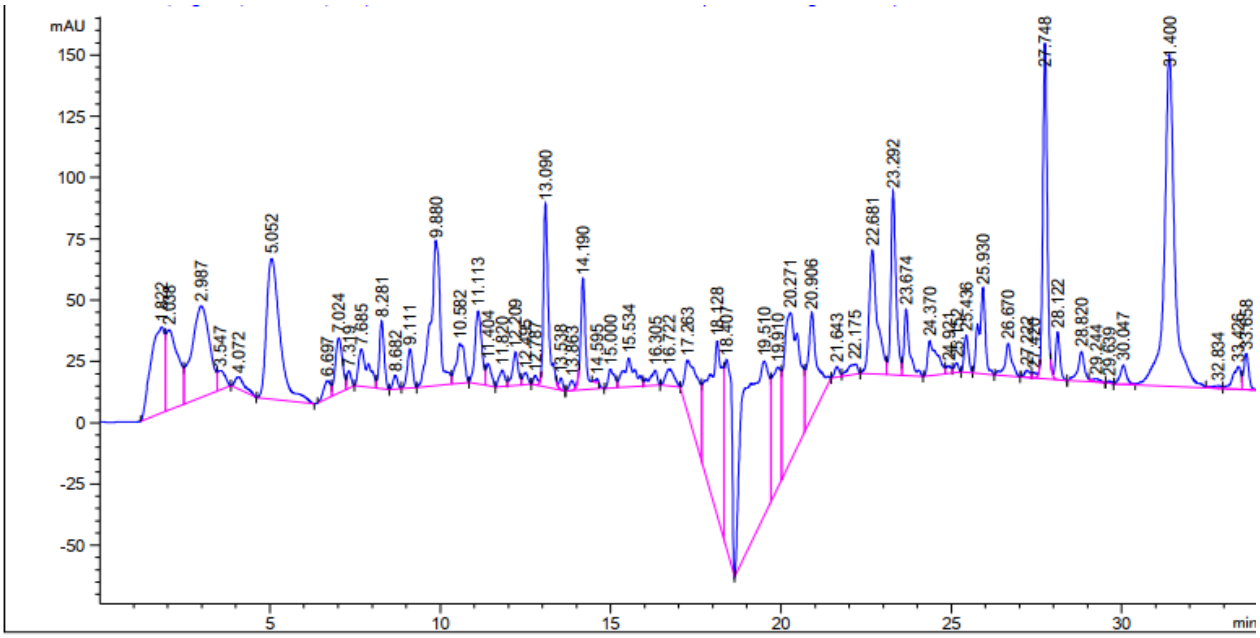

Figure 2. Chromatogram of the "Hyposedaf" dry extract.

In the composition of the "Hyposedaf" dry extract, histidine, present at 4.856877 µg/g, stands out as an essential amino acid and a key component of hemoglobin, the vital protein in red blood cells. This amino acid plays a crucial role in transporting oxygen from the lungs to the body's cells and facilitating the reverse transport of carbon dioxide. A deficiency in histidine can lead to inadequate hemoglobin production, potentially resulting in anemia. Beyond its role in blood health, histidine is also vital for the proper functioning of the gastrointestinal tract, liver, and kidneys. Additionally, the body utilizes histidine to synthesize histamine, a significant substance in the nervous system. Histamine is involved in the synthesis of numerous hormones and is critical for maintaining regular heart rhythm [8].
Table 1.

Analysis of amino acids of dry extract of "Hyposedaf"

№	Amino acid	Amount of amino acids, mkg/g
Aliphatic amino acids		
Monoaminocarbons		
1.	Alanine	0,077593
2.	Glysine	0,8991
3.	Valin	2,49772
4.	Isoleucine	0,342585
5.	Leucine	1,502734
Oxysaminocarbons		
6.	Serine	0,845982
7.	Threonine	0,310199
Monoaminodicarbons		
8.	Aspartic acid	0,321104
9.	Glutamic acid	0,31053
Monoaminocarbon amides		
10.	Asparagine	1,800129
11.	Glutamine	0,909695
Diaminocarbons		
12.	Lysine	0,194589
13.	Arginine	0,472063
Sulfur preservative		
14.	Cysteine	4,444809

15.	Methionine	2,508621
Aromatic amino acids		
16.	Phenylalanine	0,341222
17.	Tyrosine	3,820187
18.	Tryptophan	0,517421
Heterocyclic amino acids		
19.	Proline	2,178288
20.	Histidine	4,856877
Amount of non-essential amnio acids		13,544
Amount of exchangeable amino acids		15,605
Total amount of amino acids		29,15145

Methionine, with a quantity of 2.508621 µg/g, ranks next in the composition of the "Hyposedaf" dry extract. Methionine is an essential sulfur-containing amino acid that performs a number of unique functions [9].

One of methionine's key roles is in protein synthesis, and its fat-soluble properties are instrumental in preventing the development of fatty liver disease, characterized by an accumulation of fat in the liver. Additionally, methionine serves as a precursor for several hormones, including adrenaline, choline, and melatonin. Cysteine, present at 4.444809 µg/g, is another sulfur-containing amino acid. It is classified as either partially or conditionally essential. A notable feature of cysteine is its unique thiol group (-HS), distinguishing it as the sole amino acid among the 20 standard types capable of engaging in oxidation and reduction reactions.

Through oxidation, cysteine can transform into another amino acid, cystine. Cysteine is also involved in metabolic processes and plays a role in the formation of peptides and proteins [10].

Tyrosine, at a concentration of 3.820187 µg/g, contributes to reducing appetite and limiting fat accumulation. It stimulates melanin production and enhances the functioning of the adrenal, thyroid, and pituitary glands [11].

3. Conclusion

The comprehensive amino acid analysis of the "Hyposedaf" dry extract revealed a diverse array of 20 amino acids, totaling 29.151 µg/g. Among these, essential amino acids constitute 15.605 µg/g, while the remaining 15.605 µg/g are non-essential amino acids. These findings clearly demonstrate that the "Hyposedaf" dry extract is abundant in amino acids. Moreover, this richness in amino acids positions the "Hyposedaf" dry extract as a vital component in the formulation of other effective pharmaceutical products.

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