HYDROLYSATES FROM HEMP SEEDS AS ALTERNATIVE SOURCE OF PROTEIN

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Abstract

This article reveals the topic of plant proteins derived from legumes, oilseeds and pseudozerenes, offering a sustainable alternative and can be processed into functional foods. Away from the production of animal proteins that generate environmental problems. This study aims to optimize the enzymatic hydrolysis conditions for the production of protein hydrolysates from hemp seeds.

Keywords*: protein food, plant protein, hemp seeds, protein hydrolyzate protease.*

Introduction. The need for protein food to ensure a balanced diet is now extremely relevant. Sources of protein are animal and plant products. Animal proteins are full, have the entire composition of essential amino acids, are a good source of nutrition. But large-scale production leads to significant greenhouse gas emissions, pollution, water depletion and biodiversity loss. Only 18 % of calories and 37 % of proteins consumed globally are provided by animal farming, which uses 83 % of agricultural land. Agriculture is the primary cause of deforestation, which accounts for approximately 80 % of it, particularly in the Brazilian Amazon because of cattle ranching and soy cultivation. Loss of biodiversity, exceeding freshwater use limits, and significant water consumption for livestock farming also raise concerns. Plants proteins are an alternative to animal proteins because they can be produced on a large scale. Among the sources of plant protein are legumes, oilseeds and pseudo-cereals, from which functional products can be obtained. Most often use such plant sources as soy, peas, chickpeas, peanuts, oats and isolate from these plants. Also in the literature described a number of other plants that have a high protein content, a good nutritional profile, a full amino acid content and therefore can be a valuable addition to nutrition. For example, legumes are lupine, beans, peas, lentils, oilseeds - sunflower, flax, hemp, pseudo-cereals - quinoa, amaranth, buckwheat [1–3].

Hemp *(Canabis sativa)* is now gaining popularity as a source of plant protein. Hemp seeds contain 30 % oil and about 25 % protein, as well as dietary fiber, vitamins, minerals. The two main proteins from cannabis seeds are Edestin and albumin, which are easily digested and have high nutritional value. From the protein of hemp after treatment, you can get concentrates, isolates and hydrolyzates. The content of anti-nutrients contained in the seeds, tannins, trypsin inhibitors, saponins, which can reduce protein absorption, is at an acceptable level. Hemp seeds are also rich in healthy lipids with a high content of polyunsaturated fatty acids, such as linoleic acid (omega-6), alpha-linolenic acid (omega-3), and some vitamins (vitamins E, D, and A). Polyphenols and terpenoids, in particular, present in hemp seeds, provide antimicrobial, antioxidant, and anti-inflammatory properties [4].

Aim is a selection of the conditions of enzymatic hydrolysis of hemp seeds with the receipt of protein hydrolyzate.

Materials and methods. Hemp seeds are used after "cold" (45 °C) pressing of oil. Protease – alkaline protease, neutral protease, protease C (acid protease) were purchased from Enzym (Ladyzhyn, Ukraine), 2,4,6-trinitrobenzolsulfonic acid Picrilsulfonic acid acid acid acid solution (TNBS), which is used to measure the degree of protein hydrolysis, was purchased from Sigma-Aldrich Co.

Results and discussion. Skimmed crushed cannabis seeds were suspended in water and prepared 4 % solution (m/V), which was heated for 20 minutes at 90 °C and added the corresponding 1 % solution of enzymes. Hydrolysis was carried out for 12 hours at a temperature of 55 °C with constant shaking [5]. The resulting hydrolyzates were heated for 20 minutes at 90 °C to inactivate enzymes. After cooling, the hydrolyzates were centrifuged and dried. The yield of protein was calculated as a ratio (%) of dried hydrolyzate to the mass of the fat-free hemp seed powder, which was used to prepare hydrolyzates.

The degree of protein hydrolysis was assessed by a method based on the use of TNBS. This approach allows to determine the content of free amino groups, which are formed as a result of enzyme hydrolysis of proteins. The experiment compared the effectiveness of hydrolysis depending on the duration of treatment of the suspension of cannabis seeds and the used enzyme preparation. The results showed that all enzyme preparations led to the hydrolysis of proteins, but their effectiveness was different.

Conclusions. The proteins in hemp seeds do not cause food allergies and possess remarkable nutritional value. *Cannabis sativa* L. hemp seeds represent a valuable resource for the food industry, offering versatility and nutritional quality. The conditions of using different proteases for the production of protein hydrolyzates from hemp seeds are established. The presence of free amino groups in hydrolyzates is confirmed. The degree of hydrolysis depended on the duration of treatment, as well as the enzyme preparation. However, such studies require continuation in terms of increasing the release of protein and the study of its functional properties.

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