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## **PROMISING AREAS OF USE OF SOYBEAN PEPTIDE IN THE PRODUCTION OF YOGURT**

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*This study was conducted to analyze the possibility of adding soybean peptide to the yogurt in order to improve the functionality of yogurt and the effect of adding soybean peptide on the physico-chemical, organoleptic, microbiological properties of the product during manufacture and during storage. Modern research in this direction mainly concerns the functional properties of soybean peptides and their physiological functions. Soy peptide can lower cholesterol, triglycerides, low*

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*density lipoproteins and has the function of lowering blood lipids, has antihypertensive, antioxidant properties, properties and a number of other qualities that are beneficial to human health. The data on the physicochemical and real indicators of this substance allow its use in a wide range of technological parameters. It is highly soluble in water, thermostable, has no isoelectric point.*

*The use of soy peptides in food is at the development stage and requires further research. Based on current research, it has been concluded that adding soy peptide to yogurt can give the product new features. Soy peptide can be used in yogurt as an ingredient. The development of soy peptides in the food industry requires further research.*

**Keywords:** *soybean peptide, yogurt, physiological function, physicochemical properties.*

## **ПЕРСПЕКТИВНІ НАПРЯМИ ВИКОРИСТАННЯ СОЄВОГО ПЕПТИДУ У ВИРОБНИЦТВІ ЙОГУРТУ**

**Цю Сяозинь, Ю. Назаренко, Лі Бо**

*Ці дослідження проводили з метою аналізу виявлення можливості додавання соєвого пептиду в йогурт для поліпшення функціональних властивостей йогурту та його впливу на фізико-хімічні, органолептичні показники, технологічні параметри виробництва і характеристики продукту під час зберігання. Сучасні дослідження в цьому напрямі в основному стосуються функціональних властивостей соєвих пептидів та їх фізіологічних функцій. Так, ученими доведено, що активний соєвий пептид може знижувати рівень холестерину, тригліцеридів, ліпопротеїнів низької щільності та має функцію зниження рівня ліпідів у крові. Сьогодні все більше уваги люди приділяють біологічній активності пептиду сої, особливо його функції зниження рівня ліпідів у крові. Крім того, цей компонент має антиоксидантну активність. Численні дослідження показали, що соєвий пептид має багато фізіологічних властивостей, корисних для організму людини. Є також результати експериментів, що стосуються емульгуючих властивостей соєвих пептидів, але не вистачає досвіду використання соєвого пептиду у виробництві молочних продуктів. Фізико-хімічні властивості й технологічні характеристики соєвого пептиду показують, що він має високу розчинність у воді, термічну стабільність, не має ізоелектричної точки і не осідає в кислих умовах. Отже, застосування соєвих пептидів у виробництві харчових продуктів перебуває на етапі розвитку, проводяться дослідження з розробки наночастинок на основі соєвого пептиду, які можуть знизити окиснення ліпідів і підвищити рівень антиоксидантних ферментів. На підставі аналізу сучасних досліджень зроблено висновок, що додавання соєвого пептиду до йогурту може дати для виробництва продукт із новими, корисними для здоров'я людини, функціями. Пептид сої може бути використаний у йогурті як інгредієнт, але його застосування в харчовій промисловості потребує вивчення харчової цінності, фізико-хімічних,*

органолептичних та реологічних показників, а також технологічних параметрів виробництва.

**Ключові слова:** соєвий пептид, йогурт, фізіологічна функція, фізико-хімічні властивості.

## ПЕРСПЕКТИВНЫЕ НАПРАВЛЕНИЯ ИСПОЛЬЗОВАНИЯ СОЕВОГО ПЕПТИДА В ПРОИЗВОДСТВЕ ЙОГУРТА

Цю Сяодзинь, Ю. Назаренко, Ли Бо

*Данное исследование было проведено для анализа возможности добавления соевого пептида в йогурт с целью улучшения функциональности йогурта и влияния соевого пептида на физико-химические, органолептические, микробиологические свойства продукта в процессе изготовления и во время хранения. Современные исследования в этом направлении в основном касаются функциональных свойств соевых пептидов и их физиологических функций. Соевый пептид может снижать уровень холестерина, триглицеридов, липопротеинов низкой плотности и липидов в крови, обладает антигипертензивными, антиоксидантными свойствами и рядом других полезных для здоровья человека качеств. Данные о физико-химических и реологических показателях этого вещества позволяют использовать его в широком диапазоне технологических параметров. Он хорошо растворим в воде, термостабилен, не имеет изоэлектрической точки.*

*Применение соевых пептидов в пище находится на этапе развития и требует дальнейших исследований. На основании анализа текущих исследований сделан вывод, что добавление соевого пептида к йогурту может дать продукту новые функции. Соевый пептид может быть использован в йогурте в качестве ингредиента. Однако применение соевых пептидов в пищевой промышленности нуждается в дальнейшем продвижении.*

**Ключевые слова:** соевый пептид, йогурт, физиологическая функция, физико-химические свойства.

**Statement of the problem.** Soybean peptide is a small molecular peptide substance prepared by enzymatic or acid hydrolysis of soybean protein [1]. It has many physiological activities such as anti-hypertension, anti-cancer, anti-aging, anti-oxidation, anti-allergy, antibacterial, improve immunity, prevention of cardiovascular and cerebrovascular diseases, etc. These functions have been widely recognized and applied to regulate the intestinal environment and prevent physiological health effects such as diabetes [2].

Soybean peptide can be widely used in food, medicine, feed and other industries as an active ingredient in dietary supplements, functional foods and medicines. Although some products have been introduced to the market for adding soybean bioactive peptide, there are not so many studies

on adding soybean peptide to yogurt. Therefore, it is necessary to develop its application in new fields such as nutrition addition and food preservation.

**Review of the latest research and publications.** Angiotensin-converting enzyme plays an important role in the process of renin transduction, which can cause vasoconstriction and elevated blood pressure. Vishwanath used lactobacillus to ferment the soybean protein and obtained a vasopressin-transferase-I (ACE I) inhibitory peptide, which showed antihypertensive effects [3].

Lunasin is a peptide from soybean seeds which has been demonstrated to have anticancer properties [4]. It selectively kills cells that are cancerous or carcinogenic due to inactivation of tumor suppressor genes, inhibits histone acetylation, and acts as an anticancer [5].

Soybean active peptide can lower cholesterol, triglyceride, low-density lipoprotein, etc., and thus has a function of lowering blood lipids. Nowadays, people pay more and more attention to the biological activity of soybean peptide, especially its function of lowering blood lipid. Qi Binjie tested the Wistar rats with soybean peptide. Compared with the control group, the serum total cholesterol and triglyceride of the test group were lower than that of the control group, indicated that the soybean active peptide has the function of lowering blood lipid [6].

Wang, W. showed that soybean derived peptides has physiological properties that related to the prevention of chronic diseases [7].

Jianhua. Ret al. studied the reductive anti-oxidative and hydroxyl radicals scavenging activities of the soybean peptide [8]; Yuanyuan studied purification and antioxidant activity of soybean peptide [9]; Amount of results demonstrated that soybean peptides has higher anti-oxidative activity and no pro-oxidating effect [10;11;12;13].

Soybean peptide has physiological functions to modulate cellular immune systems, regulate neurotransmitters, and boost brain function [14].

Furthermore, studies have shown that soy peptides have an effect on skin and calcium binding capacity. Tokudome and Inoue pointed that soybean peptide has the ability to increase type I collagen which contribute to enhance corneal moisture content and viscoelasticity , can enhanced the skin tropocollagen level [15;16]. Liu He tested peptides with different calcium binding abilities, and the results showed that the aggregation of soybean peptides played an important role in calcium binding [17].

These studies showed that soybean peptide have many physiological activities that are beneficial to the human body. Since 1999, the US FDA has allowed soybean protein products to label the functions of preventing cardiovascular diseases. The peptides have many advantages such as comprehensive nutrition, easy absorption, good water holding capacity and

low allergenicity. Experts believe that the development and production of soybean peptides is beneficial to the development. Functional foods for human health are very suitable and have good market prospects.

**The objective of the research.** Study the use of soy peptide on the quality and technological properties of sour-milk drinks, in particular yoghurts.

**Presentation of the research material.** Numerous scientific discoveries have found a variety of special physical and chemical properties. Soybean peptide has good water solubility, water holding capacity, foaming property, thermal stability, and can be completely integrated with other food ingredients [18], and maintain their original physical and nutritional properties [19; 20].

Soybean protein has low solubility, while soybean peptide has good water solubility and can be completely dissolved without any impurities. Water solubility often determines the extent to which nutrients are absorbed and utilized.

The protein is denatured by heat, but the soybean peptide has thermal stability. Therefore, soybean peptide can be processed to produce various forms of food without causing structural changes. Proteins usually have an isoelectric point. Generally, when the pH is around 4.5, the protein in the solution will precipitate. Soy peptide has no isoelectric point, does not precipitate under acidic conditions of pH 4.5, and can be completely dissolved under any acid-base conditions of pH 2–10.

In vitro tests confirmed that more than 95% of the soybean peptide was not digested by pepsin treatment; after trypsin treatment, about 90% was not digested. This indicated that the soybean peptide is no longer digested and most will be directly absorbed in the form of peptides.

Yogurt contains a lot of vigorous lactic acid bacteria. How to improve the content and vitality of active probiotics in fermented milk has become a hot research topic. When soybean peptide is used in the production of yoghurt, it can improve production efficiency, stabilize quality, increase product flavor, increase nutritional value, and significantly inhibit the growth and reproduction of *E. coli* and other aerobic bacteria, especially for the production of yogurt or probiotic milk beverage. Naoki Izawa et al. pointed that added soybean peptide to milk can increase the hyaluronic acid (HA) yield from *Streptococcus thermophilus* YIT 2084 [21].

Studies indicated that the addition of soybean peptide has a significant promoting effect on the growth of lactic acid bacteria. The proportional addition of soybean peptide can promote the growth and acid production of lactic acid bacteria in milk to varying degrees.

There are many anti-nutritional substances in soybeans, such as trypsin inhibitor, hemagglutinin, anti-vitamin substances, etc., which will

cause harm to the human body. Soybean peptides do not contain anti-nutritional ingredients [22]. Studies have reported that soybean peptide have very low sensitization and are therefore safer to consume [23].

Soybean peptide contains 9 essential amino acids, rich in nutrients [24;25], and the amino acid composition is almost completely the same as that of soy protein. The essential amino acids are balanced and rich in content; soybean peptide has small molecular weight, good water solubility; easy to digest and absorb; therefore, soybean peptide can be added to yogurt. The development of new yoghurt products can strengthen the nutrition of dairy products and increase the added value of products, which is the development trend of dairy products industry.

Based on the information obtained from the current studies, it can be concluded that soybean peptide can be used as an additive in the production of yoghurt without significant adverse effects on its physicochemical, microbiological and sensory properties, and in addition, it can increase the functionality of the product. The production of yogurt containing soybean peptide can increase the utilization of peptide, and the product can be regarded as a nutritious health food that may promote health.

Zhang Yuanhong et al. aimed to develop a new type of soy peptide-based nanoparticle (SPN) for active cargo delivery, which can reduce lipid peroxidation and elevate antioxidant enzymes levels [26]. The Soybean peptide nanoparticles (SPN) were fabricated by ultrasound-induced self-assembly. SPN-stabilized O/W emulsion was stable against coalescence during storage. it could significantly improve physical stability and oxidative stability of the emulsions, act as a novel emulsifier to prepare stable O/W emulsions [27]. Xu Wang et al. treating the soybean peptide and the dextran by physical and chemical methods, the surface activity of the composite can be improved, and the composite has significantly improved emulsification properties [28].

**Conclusion.** Studies provided scientific basis for the application of soy peptide in the food industry. However, the interaction between soy peptide and functional components such as dextran, curcumin and collagen peptide requires further research. The application of soy peptides in the food industry needs to be further promoted.

In recent years, the dairy industry is highly competitive and product homogeneity is serious. How to effectively achieve market breakthrough is a major concern for every dairy company. Soybean peptide is a small molecular substance that has been transformed into soybean protein. These small molecular substances have certain physiological activities. When they enter the body, they exert their special effects, which can quickly restore fatigue, strengthen muscle strength, and promote lipid metabolism. The function, combined with dairy products, not only can provide consumers

with rich nutrition, but also can play a certain health effect. Give the product a new function, there will attract the consumer's attention, the differentiation is obvious, the product grade is improved, and the new selling point will naturally increase the competitiveness of the product.

The study of the characteristics of yogurt and its technological properties with the addition of the composition of the product of soybean peptide is promising for further research.

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## **ХАРАКТЕРИСТИКА АРОМАТИЧНИХ ДЕСКРИПТОРІВ ПРОДУКТІВ РЕКТИФІКАЦІЇ МОЛОЧНОЇ СИРОВАТКИ**

**Т.П. Синенко, Г.Є. Дубова**

*Питання покращення специфічного аромату молочної сироватки пов'язане з її подальшим використанням та промисловою переробкою. Розглянуто властивості складових компонентів молочної сироватки за здатністю утворювати і змінювати ароматичні дескриптори. Серед складових частин молочної сироватки, які впливають на зміну аромату, відзначено білки. Установлено, що під дією ферментів ароматичні властивості сироватки*