

# **ИННОВАЦИОННЫЕ ТЕХНОЛОГИИ И БЕЗОПАСНОСТЬ ПИЩЕВЫХ ПРОДУКТОВ**

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## **INNOVATIVE TECHNOLOGIES AND FOOD SAFETY RAW MATERIALS OF ANIMAL ORIGINS**

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Министерство образования и науки Российской Федерации  
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Краснодарская краевая общественная организация  
Научно-техническое общество пищевой промышленности

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В сборнике представлены материалы по описанию современных технологических приемов переработки пищевого растительного и животного сырья. Выявлены проблемы безопасности сырья и готовой продукции. Представлены новейшие российские разработки в области импортозамещения при производстве продуктов питания из сырья растительного и животного происхождения. Сформулированы теоретические положения применения в пищевых отраслях CO<sub>2</sub>-экстрактов и других пищевых добавок из растительного сырья. Приведено эффективное технологическое оборудование в области хранения и переработки сельскохозяйственной продукции.

Материалы, помещенные в сборнике, публикуются по авторским оригиналам.

The collection contains materials on the description of modern technological methods for processing food plant and animal raw materials. Problems of safety of raw materials and finished products are revealed. The latest Russian developments in the field of import substitution in the production of food products from raw materials of plant and animal origin are presented. Theoretical positions of application in food branches of CO<sub>2</sub>-extracts and other food additives from vegetative raw materials are formulated. The efficient technological equipment in the field of storage and processing of agricultural products is given. The materials placed in the collection are published according to the author's originals

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## **INFLUENCE OF FOOD FACTOR ON METABOLIC PROCESSES OF SPORTSMANS OF GAME SPORTS**

Lobanov V.G., Kasyanov G.I., Mazurenko E.A.  
Kuban State Technological University Annotation.

The article analyzes the influence of the food factor on the functional characteristics of the organism of sportsmen of gaming sports: basketball, volleyball, handball, rugby and football. Indicators-markers determining the indices of the human body after intense physical and stressful loads have been established. The positive influence of cryoporous powders on the adaptation of the athlete's organism to the loads of glycolytic and mixed nature was revealed, which correlates with the results of the clinical examination and the test results. The physicochemical and functional characteristics of fruit and berry cryopowders enriched with CO<sub>2</sub>-extracts and CO<sub>2</sub>-meal are determined.

*Key words:* sportsmen, game sports, food factor, cryoporous powders, endurance of the organism

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## **DEVELOPMENT AND TECHNOLOGY OF DAIRY PRODUCTS FOR HERO-DIETARY PRODUCTS**

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*Annotation.* Population aging is one of the global problems of the modern world. Today, there are various, contradictory opinions about the possibility of prolonging life. Aging is the inevitable process of all living organisms, but healthy aging is the main condition for the functioning of an economically strong state. Overcome the inevitable economic, medical, social and other risks arising from the progressive aging of the population can only be done jointly, rethinking and promoting the experience of successful countries in solving these problems and acquiring new skills and knowledge together. Equally important is the fact that in science it is time to move from fragmentary studies to systemic ones, pooling resources and technologies to achieve global for all mankind. The purpose of the given work is to conduct research, develop recipes and technologies of a dairy product ready for use for gerodietic nutrition.

*Key words:* gerodiet, gerodietetic nutrition, vegetable raw materials, animal raw staff, prevention, longevity, geroprotectors.



According to the classification of the World Health Organization, elderly people are aged between 60 and 74, to the old - from 75 to 89 years, and to long-livers - 90 years or more. Sociologists call these periods of human life "the third age", and demographers introduce the concept of "third" (60-75 years) and "fourth" (more than 75 years) ages [1].

And in modern conditions the age classification, approved by the Congress of gerontologists and geriatricians of the world, is most acceptable. According to this classification, the entire population over 50 years is divided into 3 age categories:

- mature age - people 50-60 years old;
- The elderly people are 61-74 years old;
- advanced age - people older than 75 years and older.

People aged 90 and over are classified as long-livers [2].

According to WHO published data on life expectancy in the world in 2015, the following: (83.7 years), Singapore (83.1), Australia (82.8), Spain (82.8) and Iceland (82.7) are leading in terms of overall life expectancy. Now with regard to the life expectancy of women. Almost in all developed countries of the world it is higher than the life expectancy of men.

In terms of women's life expectancy, Japan ranks first (86.8%), Singapore (86.1%) in the second place, Spain and the Republic of Korea (85.1%), France (85.4%), Switzerland (85, 3), Australia (84.8).

In terms of men's life expectancy, Switzerland (81.3) is in first place, Iceland (81.2) in the second place, 81.2 in the third, Australia (80.9), Sweden (80.7), Israel (80.6), Italy (80.5), Japan (80.5). The average life expectancy in Russia is 71.7 years, in Belarus - 72.3, in Ukraine 71.3 [3].

And in Kazakhstan, according to the United Nations Statistics Department as of early 2017, the average life expectancy at birth (for both sexes) is 68.5 years (years). This is below the average life expectancy in the world, which is around 71 years (according to the Population Division of the United Nations Department of Economic and Social Affairs). The average life expectancy of men at birth is 63.2 years (years) (Kazakhstan Population Counter, 2017)

The average life expectancy of women at birth is 74.1 years (years). The ideal life expectancy for a man recognized by the leading scientists of the world is 110-120 years. The actual life expectancy of a Kazakh is shorter than the ideal one for almost half a century. For many of our citizens, a significant period of the end of life is captured by confronting diseases associated with age: diseases of the cardiovascular system, oncology, neurodegenerative diseases, diabetes mellitus of the second type and its complications, etc. Providing healthy aging, we not only approximate the real life expectancy to ideal, but also significantly improve the quality of life, shifting the inevitable period of struggle with age-related diseases to a later age. It is obvious that each of us, as some famous American sociologist Edgar Freidenberg once said, 'I would be happy to live long and die quickly'. Precisely due to the problems of gerontology concern the life of every person, they are extremely relevant today [4].

In order to achieve the main goal of the Message of the President of the Republic of Kazakhstan "Strategy" Kazakhstan-2050 ": the new political course of

the held state" on the entry of Kazakhstan into the list of 30 developed countries of the world, the activities of the Ministry of Health of the Republic of Kazakhstan are aimed at improving the health of citizens by creating a modern and effective health system.

In 2015, the implementation of the State Program for Health Development of the Republic of Kazakhstan "Salamatty Kazakhstan" for 2011-2015 was completed. Its main achievements were the increase in life expectancy up to 72 years (2014 - 71.45, 2013 - 70.85), the reduction of the total mortality of the population to 7.48 per 1000 population (2014 - 7.57, in 2013 - 7.98) [5].

An indispensable condition for longevity, preservation of health, ability to work, vivacity is proper nutrition. Nutrition is a complex process of ingestion, digestion, absorption and absorption of nutrients in the body.

Taking into consideration the high rates of growth in the population of the elderly and senile age people in our country, complicated by concomitant diseases, scientists and manufacturers, the problem of maintaining the health status of this population group is being solved by.

Eating habits of elderly and senile people is an actual problem. The life expectancy, their health and ability to work largely depends on how well the diet is organized. Starving or overeating, systematic malnutrition, low-calorie or, on the contrary, high-calorie food, inferior in its amino acid composition or predominantly carbohydrate diet or incorrect nutrition in relation to the basic nutrients (proteins, fats and carbohydrates), can certainly have bad affect on metabolic processes in body and on its general condition. Various disorders in nutrition can be the cause of the development of certain diseases, and, in turn, contribute to premature aging of the organism [6].

In the list of recommended foods and dishes, and especially their preparation for the elderly, there are bread and bakery products, soups, meat dishes, poultry and fish, dishes from cereals and vegetables, vegetables, egg dishes, fruit, berries, sweet dishes, sweets, salt and milk, dairy products. All kinds of dairy products, milk, kefir, yogurt, acidophilus, fermented baked milk are highly recommended. Sour cream and cream are somewhat limited. Cottage cheese is recommended in low fat types, medium fat and from skim milk [7].

A lack of calcium in older people, causes osteoporosis, which is due to the extinction of the glands of the digestive tract and the dysfunction of the glands of internal secretion. The lack of an element leads to the destruction of bone and nerve tissues, the bleeding of capillaries, the reduction of the general resistance of the organism to diseases [8].

The modern market has a wide assortment of baked goods of the gerodietetic direction ("8 cereals", "Healing", "Voskresensky", iodized and fortified bread), cereal products (porridges) with various additives and phytocomponents. Among the confectionery products excel those which can based on natural sweeteners, having a diabetic character with vitamin supplements.

A certain gerodietetic orientation is noted in the meat-processing industry.

In the diet of elderly and old people, the share of carbohydrates should be 55-60% of the total energy value of the diet. A high enough activity of amylases is observed in elderly and old people. In this regard, recommendations were developed to increase the proportion of complex carbohydrates (starch) and reduce the proportion of simple carbohydrates (sugar) in the diet of this group of people. This problem is solved by the recently developed products using milk and vegetable raw materials: on the basis of whey, wheat germ; from skimmed milk with wheat bran; low-fat cottage cheese with buckwheat or semolina; with an extract from sprouted seeds of buckwheat and millet, with flour from cereals (wheat, corn, buckwheat, oatmeal, oatmeal).

Currently, wide consumer preferences for the population, including for the elderly, have received sour-milk bioproducts enriched with probiotics (bifido and lactobacilli). These are kefir or yogurts "Bifidok", "Bifilife", "Bifilan", "Bioiogurt", "Activia", sour-milk-vegetable yogurt product enriched with esters of plant sterols (phytosterols), "Danakor", lowering the level of cholesterol [9].

Analyzing the literature sources of information, and revealing the issue of the demographic state of our country, we can confidently say that today the problem of expanding the assortment of gerodietic dairy products with geroprotective properties is topical and expedient.

Conducting research for the development of recipes and technologies of dairy products / camel milk /, ready for use for gerodietetic nutrition

For research and development of the dairy product of the gerodetic orientation, camel's milk, vegetable oils, protein cereals were chosen as the main raw material.

Camel's milk is very valuable and nutritious for humans and is used for food in whole or processed into fermented milk products. It has a pure white color, a sweet-sweet or sweetish-brackish taste, a thick consistency, with a strong transfusion foam. In terms of chemical composition, camel's milk differs significantly from mare and cow, as it contains more fat, protein and minerals.

The content of individual components in the milk of camels varies depending on the lactation period, the seasons of the year, feeding, species and breed.

Camel's milk contains on average 86% (with fluctuations from 83.2 to 88.44%) of water and 14% (with fluctuations from 11.56 to 16.87 °) of dry matter.

Protein. Milk contains several types of proteins and other nitrogen-containing compounds. This combination of proteins, their chemical and biological properties are due to the amino acid composition of milk. Camel milk contains all amino acids, including essential ones.

Of all the proteins in milk, casein, albumin and globulin are the most abundant. Casein is in the milk in a colloidal state in the form of a casein-calcium-phosphate complex. In nature, there are no more proteins such as casein. Under the action of rennet and weak acids, casein precipitates. In camel milk, casein forms gentle flakes, which easily break up into small particles when the shubat is needed. Albumin and globulin are dissolved in the plasma of milk and belong to serum proteins. They have important physiological significance and as carriers of immune properties, transmitted with the mother's milk to the newborn.

By the ratio of casein, albumin and globulin, camel's milk is similar to milk of mares. The milk of Kazakh bactrian contains 3.62-3.84% of total protein, including 2.52-2.80% of casein, 0.82-0.90% of albumin and globulin. According to the data of S.G. Kheraskov, the milk of single-horned camels contains protein: 3.6%; including casein - 2.80, albumin and globulin 0.87%; hybrids-fumes -3.69; 2.71 and 0.84%, for cosbacs - 3.7; 2.8 and 0.9% respectively.

The amino acid composition of camel's milk was studied by P.V. Kugenev. According to his observations, it differs from cow milk by the increased content of arginine, lysine, histidine, phenylalanine, methionine, leucines, glutamic and aspartic acids, glycine and valine. In comparison with the mare's milk, it contains 18% less arginine and 0.9% serine. In terms of amino acids, camel's milk concedes only to sheep's milk. Fat is the main source of energy for the animal body, which is necessary to maintain the heat balance and the formation of muscular energy.

When oxidizing 1 g of fat, 9.3 calories of heat are released, while 1 g of protein or carbohydrates gives, 4.1. Therefore, the main quality indicator in the evaluation of milk is its fat content [10].

As a functional component of vegetable oils, the chemical composition of flax-seed oil is preliminarily studied, and the brown rice is used for the cereal. Flax seed oil is an excellent external source of valuable polyunsaturated fatty acids Omega-3 and Omega-6, the chemical composition of which is indicated in Table 1.

Table 1 - Chemical composition of linseed oil.

Name of products	Chemical composition of the product			Caloric value
	proteins	lipids	carbohydrates	
linseed oil	0,1	99,4	0	899

If Omega-6 is also present in soybean, sunflower, mustard, rapeseed and olive oil, then Omega-3 is contained in sufficient quantities only in linseed oil. In the oil from flax seeds, the Omega-3 content is 2 times more than in fish oil, and significantly higher than in other food products. Getting into the body, Omega-3 and Omega-6, are introduced into the cell structure, and in the future positively influence the cellular activity, the speed of transmission of nerve impulses. It is because of the high content of Omega-3 and Omega-6 that flax seed oil helps to normalize metabolic processes in the body and has the following useful healing properties: Regular use of linseed oil in the diet helps reduce cholesterol and blood viscosity, increase the elasticity of blood vessels, ultimately, prevents the development of myocardial infarction, atherosclerosis, hypertension, ischemic heart disease, reduces the risk of stroke and blood clots. In addition, flax seed oil normalizes the work of the entire digestive system of a person: improves liver function, promotes the treatment of colitis, gastritis, eliminates constipation, heartburn, has an antiparasitic effect. The immuno-protective properties of the oil are invaluable: its use as a food product prophylactically prevents some oncological diseases (breast cancer and rectal cancer)

Brown rice is rich in vitamin B1 (thiamine) (in 100 g - 29.7% of the daily norm), vitamin RR (nicotinic acid) (respectively - 25.5%), biotin (24.0%), vitamin B6 (pyridoxine) ( 23.8%), pantothenic acid (22.0%), vitamin B9 (folic acid) (13.3%) and

choline (11.6%). In the mineral composition, silicon predominates (1003 grams - 1253.3% of the daily norm), vanadium (1000.0%, respectively), boron (320.0%), manganese (132.5%), cobalt (69.0% ), phosphorus (47.0%), molybdenum (38.1%), selenium (30.8%), magnesium (28.6%), nickel (24.6%), lithium (19.5%), rubidium (18.8%), zirconium (18.5%), copper (17.5%), zinc (14.2%), potassium (10.2%), iron (10.0%), thallium 9.3%).

Brown rice contains proteins (10.6%), essential and non-essential amino acids (in 100 g - 14.4% and 8.8% respectively). In the composition of essential amino acids prevail: valine (21.1%) and isoleucine (18.2%); interchangeable amino acids are less, glycine (11.4%), glutamic acid (11.1%) and arginine (10.5%) prevail in their composition.

Like any other type of rice, brown rice, unlike other cereals, does not contain gluten - a vegetable protein that can cause celiac disease in some people.

In comparison with grinded rice, the grain of unpolished rice contains 3.1-3.5 times more fat, which consists mainly of omega-6 polyunsaturated fatty acids (namely linoleic acid, 100 g - 9.6% of the daily norm) .

In non-polished rice, phytosterols are contained in small amounts (in 100 g - 18.5% of the daily norm), in the composition of phytosterols, beta-sitosterol predominates (11.0%, respectively).

Rice brown contains a lot of carbohydrates (the content of carbohydrates in 100 g is 21.9% of the daily allowance, ie 77.2 g), based on starch (100 g - up to 68.9 g). High is the content in unpolished rice pectin (in 100 g - 36.0% of the daily norm) and fiber (respectively - 13.6%). Brown rice contains small amounts of sucrose (in 100 g - up to 0.85 g) and purine bases (in 100 g - 11.7% of the daily norm).

The content of oxalic acid in 100 g is 13.8 mg, which is 3.5% of the maximum allowable daily level of its consumption [10].

In order to develop a gerodietic product based on camel's milk, which has geroprotective properties, it is possible to simulate a scheme similar to the traditional production of fermented milk products using yoghurt starter. A feature of this production will be the introduction of functional components, at the stage of cooling the finished bunch.

Fermented milk product based on camel milk with the addition of functional components will have a number of useful properties that will make it possible to recommend it to elderly people with cardiovascular diseases, gastrointestinal tract suffering from atherosclerosis, hypertension, iron deficiency anemia, obesity, loss of visual acuity, osteoporosis.

Considering that the preservation and improvement of the health of the population of the entire globe is a weighty problem, it is necessary to unite all efforts to maintain health, prolong the youth of the elderly population, contributing to the preservation not only of the spirits of the spirit, but also of the body. In this regard, the development of dairy products for gerodietic nutrition, which contribute to an increase in the active period of life of an elderly person is an indispensable task of modern science.

The product that will be developed will be the main recommended sour-milk product for gerodietetic nutrition, which has geroprotective properties. It has a sweet specific flavor and a thick consistency.

The Food and Agriculture Organization of the United Nations emphasizes the therapeutic benefits of camel's milk products. And also notes that doctors prescribe camel's milk to patients in Russia, Kazakhstan and India. In appearance and taste, camel's milk is practically the same as cow's, it is white, with a sweetish and slightly salty taste, the intensity of which is determined by the animal's feed and water quality. Since ancient times, people have appreciated and used camel's milk in the treatment of various diseases. It was especially beneficial for people with diabetes, and at that time they did not yet know the disease as diabetes, but nevertheless people suffering from the symptoms of the "sugar" disease felt serious relief and were on the mend with the daily use of camel's milk.

Already later, scientists discovered in the beverage an insulin-like protein that does not break down when ingested in the gastrointestinal tract and enters the bloodstream. Thus, camel's milk replaces the injection of insulin, which people are forced to do through injections, as the usual insulin is simply impossible to take through the pill, as it immediately collapses when it enters the stomach. As a rule, daily intake by people with type 1 diabetes, 500 ml of camel milk normalizes the level of glucose in the blood, and, thereby, reduces the daily need for expensive and unpleasant injections of insulin.

Camel's milk is very nutritious and absolutely safe for consumption. It is believed that people who drink camel's milk on a regular basis are less prone to disease. The composition of camel milk is almost the same as the breast milk. Being enriched with proteins and vitamins, it is an ideal food supplement for health, as well as malnourished children and adults.

In camel milk is a huge amount of vitamin C, so it is necessary in a desert where fruit and vegetables are rare. The content of vitamin C in camel's milk is three times higher than in cow's milk.

It contains important minerals such as potassium, zinc, manganese, copper, magnesium, sodium and iron. Calcium and phosphorus strengthen bones and teeth, iron prevents the occurrence of anemia, zinc and cobalt are part of the vital cellular enzymes of the body. Camel milk contains more solids than cow milk. The greatest value is represented by protein substances. They are absorbed by the body by 98%. Basically it is casein, albumin, globulin.

Casein is in the form of a casein-calcium phosphate complex. Under the action of rennet and weak acids, casein precipitates. In camel milk, it forms gentle flakes, which easily break down into small parts with stirring. Albumins and globulins are dissolved in the plasma of milk and belong to serum proteins. They have important physiological significance, as carriers of immune principles.

In the milk of Bactria there is a total protein of 4.45%, including casein 3.22, albumin 0.71 and globulin 0.46%. Camel's milk is better absorbed than cow's milk, it is classified as albuminous type of milk. According to some scientists, camel's milk contains a significant amount of amino acids that contribute to the formation of blood

balls. In medicine, camel's milk is considered an ideal remedy for heart disease, and it also helps treat gum sick.

Camel's milk strengthens bones and is especially useful to people suffering from calcium deficiency and bone disease, especially in the case of osteoporosis. It is an excellent drink for the health of people suffering from a deficiency of nutrients.

Milk sugar or lactose plays a huge role in suppressing putrefactive processes in the intestines, contributes to the development of useful microflora. Its average content is 4.5 - 5%. In general, the amount of sugar in the milk of camels is higher than that of cows. By the lactation months, the number of these indicators varies insignificantly. In the case of chronic gastritis, the treatment of poisoning and other intestinal disorders, camel milk contributes to the cessation of the inflammatory process in the mucosa and normalizes the acidity of the gastric juice. It also has a toning effect on a person, strengthens the nervous system.

The use of camel milk on a regular basis, enhances the immune potential of the body. The main function of the natural immuno modulator milk camel is to protect the body from autoimmune diseases, allergies and certain types of bacterial, fungal and viral infections. You can drink camel milk every day, just to maintain immunity.

The use of camel milk from cancer and leukemia has a scientifically valid basis. Thus, at the Cancer Institute in Baghdad, experiments were conducted to study the composition of this milk and an active substance was isolated that cleanses the body of compounds that provoke cancer. The matter is that camels have a very developed immune system, it fights not only with external infectious agents and foreign substances, but also with the organism's aggression towards itself. The use of camel milk from cancer has already proved its effectiveness in clinical practice.

Israeli scientists are currently conducting laboratory tests of a drug against cancer based on camel milk. Testing on laboratory mice showed 100% effectiveness in the treatment of blood cancer (leukemia). The drug can also be successfully used to treat lung, liver and breast cancer.

Useful properties are and dairy products made from camel milk, they are considered very valuable and dietary. Long since sour-milk products based on camel milk have been used to treat tuberculosis and other diseases that deplete the body, ulcerative lesions of the gastrointestinal tract.

Today there are about 250 small plants in our republic with a capacity of 5 to 50 tons of milk per day. Having voluntarily undergone technical re-equipment and modernization, they have enriched our market with suzbe, kurt, irimshik, shubat, ryazhenka, yogurt and so on. Kazakhstanis willingly buy also Russian yoghurts, Kyrgyz butter and beverages, Ukrainian cheeses and other imports.

And the branch of camel breeding and processing of its milk, which also enters the milk market is well developed in Kazakhstan, and the production of camel farms is invariably in demand among local residents.

At the moment, in Kazakhstan, out of some types of milk, except camel, there have been developed gerodietic products like fused cheese [11], curd products enriched with yoghurts, but new products from camel's milk of gerodetic purpose were started before that time. It should be noted that to date, the technology of preparation

of a sour-milk product for gerodietic nutrition, where camel's milk is the main raw material, has been researched and is being developed at the department of "Technology of food products" of the Almaty Technological University.

Since the very science of gerodetics began to develop in Kazakhstan 20 years ago, but was not at such a high level, the products of this appointment were given little attention. In recent years, the actual life expectancy of a Kazakh has been shorter than the ideal for almost half a century. For many of our citizens, a significant period of the end of life is captured by confronting diseases associated with age. And the main criterion for confronting these diseases is proper nutrition. As it mentioned above, the most effective in this direction is camel's milk among all dairy products. Fermented milk product from camel's milk can be used in practice in the prevention and treatment of elderly and senile people in Kazakhstan, which will increase the life expectancy of the population.

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## **РАЗВИТИЕ ТЕХНОЛОГИИ МОЛОЧНЫХ ПРОДУКТОВ ДЛЯ ГЕРОДИЕТИЧЕСКОГО ПИТАНИЯ**

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*Аннотация.* Старение населения - одна из глобальных проблем современного мира. Сегодня существуют различные, противоречивые мнения о возможности продления жизни. Старение является неизбежным процессом для всех



живых организмов, но здоровое старение является основным условием функционирования экономически сильного государства. Преодоление неизбежных экономических, медицинских, социальных и других рисков, связанных с постепенным старением населения, может быть сделано только совместно, путем переосмысления и продвижения опыта успешных стран в решении этих проблем и совместном приобретении новых навыков и знаний. Не менее важно то, что в науке настало время перейти от фрагментарных исследований к системным, объединяя ресурсы и технологии для достижения глобального успеха для всего человечества. Целью данной работы является проведение исследований, разработка рецептов и технологии изготовления молочных продуктов, готовых к использованию для геродиотического питания.

*Ключевые слова:* геродиета, геродиетическое питание, растительное сырье, животное сырье, профилактика, долголетие, геропротекторы

**УДК 664:542.69:621.867.4**

## **ВЛИЯНИЕ ВЛАГОТЕПЛОЙ ОБРАБОТКИ И ПЛЮЩЕНИЯ ЗЕРНОВЫХ ПРИ ПРОИЗВОДСТВЕ КОМБИКОРМОВ НА ПРОДУКТИВНОСТЬ ЖИВОТНЫХ**

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Влаготепловая обработка зерновых культур с последующим их плющением позволяет производить комбикорма повышенной усвояемости и доброкачественности. Для эффективного расходования комбикормов разработана технология плющенных зерен, заключающаяся в увлажнении, пропаривании, плющении и сушке зерна. В процессе влаготепловой обработки и плющения происходит расщепление крахмала, который легче подвергается воздействию ферментов. Установлено, что с уменьшением величины зазора между валками степень клейстеризации увеличивается. Выявлено, что длительность пропаривания и расход пара увеличивают степень клейстеризации крахмала. Проведены исследования по выявлению влияния степени клейстеризации крахмала на его переваримость. Полученные результаты показали, что количество образующейся глюкозы при ферментативном гидролизе крахмала за одинаковый промежуток времени в более клейстеризованном зерне больше по сравнению с менее клейстеризованным. По сравнению с исходным ячменем скорость переваримости крахмала хлопьев из пропаренного ячменя с высокой степенью клейстеризации повышается в 2,0-3,5 раза. Причем, крахмал хлопьев из пропаренного ячменя со 100 % степенью клейстеризацией расщепляется с образованием глюкозы в течение 4 часов. Хлопья, полученные из пропаренного ячменя с высокой степенью клейстеризации, имеют лучшую переваримость крахмала. Отсюда следует, что продолжительность пропаривания является основным фактором, влияющим на переваримость протеина ячменя, обработанного паром при атмосферном давлении.

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## **RECEIVING AND PRESERVATION OF NET PRODUCTION OF APPLES AS SOCIAL FACTOR OF IMPROVEMENT OF POPULATION HEALTH OF THE POPULATION**

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*Summary:* The special attention is focused on screening of modern technologies of cultivation and storage of ecological clean apples. In this article the choice of biologically safe system of protection of apple-trees and preservation of production is reasoned. Chemical and biological ways of protection and storage are considered, an analytical assessment is given.

*Keywords:* bioprotection, storage of apples, organic agriculture

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