

ХАРЧОВІ ТЕХНОЛОГІЇ

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HIGH PROTEIN BARS WITH INCREASED ANTIOXIDANT ACTIVITY AS AN ALTERNATIVE PORTABLE NUTRITION IN THE GENERAL HEALTH SYSTEM

Proteins are considered the most important macronutrients for the human body. They perform many useful functions: participate in the formation of the immune system at the cellular level, help in the synthesis of enzymes, hormones, blood plasma proteins; synthesize antibodies that counteract pathogens; provide the body with energy, turning into amino acids when broken down. Despite the fact that proteins are contained in a variety of food products and raw materials and are divided into animal and vegetable proteins, the human body constantly experiences a lack of protein, because 100–150 g of its daily consumption is necessary for a complete replenishment. Most of the proteins take part in detoxification processes from xenobiotics, and some have a low level of assimilation, which creates a constant shortage of these useful nutritional components. The market of protein bars occupies a powerful niche in many food segments: health, fitness, dietary, vegetarian, sports, preventive, children's, etc. Bars are considered healthy snacks and belong to alternative portable nutrition for the purpose of maintaining carbohydrate, protein, vitamin, antioxidant, energy balance, quickly suppressing hunger and improving mood. Some assortment items are even recommended for weight loss. Protein consumption is well known to reduce levels of the hunger hormone ghrelin and help reduce food intake naturally. It should be noted that not all protein bars are made from useful, so-called "correct" ingredients. The content of at least 8 g of protein and 3 g of fiber per serving is considered an important sign of usefulness – the minimum satisfaction of nutritional needs. Today, several concepts of protein bars can be distinguished, among which protein bars for weight loss, for training (at various stages), energy bars, mini-snacks, portable meal options, ideal (high protein) are especially prevalent. Considering the uniqueness of protein bars, the undeniable relevance of their production, it is necessary to emphasize that there is a problem of disorganization of information regarding their classification, recommendations for the selection of ingredients, consumption, quality criteria and safety of production.

Keywords: protein bars, healthy food, snack products, technology.

Statement of the problem and its relevance. Food as medicine remains in trend, so protein, fiber, vitamins and antioxidants continue to hold leadership in the composition of combined fast food products. Useful and practical offers of snack products are increasingly becoming requests in online stores, as the growing awareness of consumers about their health creates the best conditions for the growth of this market segment. Bars are quite popular and useful offer of portable food, as they have convenient shapes, can satisfy any taste and become a product of many diets. Growing awareness of the bars' health benefits and nutrient content to help repair tissue, reduce cravings for fast food, regulate blood pressure and help with weight loss are some of the main factors driving global demand and ultimately the market. Growing awareness of the benefits of protein bars is also driving overall sales. Bars fortified with useful substances contain a powerful protective weapon for the organism – easily digestible protein of both plant and animal origin, which provides the body with an additional amount of energy and means of cell and tissue regeneration.

Protein bars have technological appeal for simulating nutrient content, such as those that regenerate damaged tissue as a result of protein and essential amino acid deficiencies.

The demand for healthy food forms advanced technologies for the development of ready-to-eat food products in small portions in one-time, convenient packaging.

So, according to Viby, specialist developers Arla Foods Ingredients pioneered the idea of energy bars, allowing businesses to increase protein content by including protein concentrates and synthetic amino acids in food bases, fillings and glazes without compromising taste or texture. Arla Lacprodan milk chocolate mass is made with whey protein and milk protein ingredients to maintain its taste and softness throughout its shelf life, and contains 30 % protein per product. This is a sufficiently high protein content, that is, such a product offer became the first bar with a high protein content.

Seeing the growing popularity of protein bars, the focus on reducing calories due to the content of carbohydrates, i.e. the need to reduce the amount of sugar, is becoming more and more important for companies that manufacture snack products of this type. It is the development of such technologies – high-protein bars with the label "sugar free" or "sugar 0 %" that will become a new growth vector of the market of bars in the coming years. In addition, consumption of diet bars by athletes and active users in the fitness industry is also predicted to increase.

An analysis of reliable sources revealed the reasons why the number of sales of protein bars is increasing, namely: for the purpose of increasing energy, for muscle growth and weight control. In addition, there is an increase in advertising and other means of marketing initiatives in fitness clubs and centers, points of sale of sports nutrition, including Internet stores of energy bars, as an alternative diet with an emphasis on healthy nutrition. It is expected that fitness clubs will become points of growth in demand for protein bars in the next 10 years.

The uncertain situation around the world has forced and continues to activate consumers to increase food consumption, which can lead to gaining excess weight. However, the growing awareness of the public about the elements, methods, techniques of healthy eating and healthy food controlled by calories and the quality of these calories increases the interest in products in small portions, but nutritious and tasty, which contribute to general improvement and well-being. An exemplary example is energy bars, for example, with crunchy textures, a reduced amount of sugar and carbohydrates. Also, as people started working from home or staying at home more often, the need for protein bars increased. Because there is no opportunity or time to prepare homemade meals, or to use the services of catering establishments or to receive organized meals at the workplace.

Analysis of recent research and publications. The protein bar market is predominantly segmented based on sources, type, and region, by type of raw material: plant-based or animal-based. The latter involves only a combination of proteins of plant and animal origin (exclusively dairy and/or whey, or in small quantities – egg white); by type of nutrition: for sports nutrition (functional), snack. Plant-based protein bars are expected to continue to dominate the industry.

Bovine whey proteins have been shown to provide health benefits to consumers by combating oxidative stress, improving the process of glutathione synthesis in the liver to enhance the body's antioxidant defenses [4], creatine supplementation increases muscle performance and reduces fatigue, providing higher intensity and duration of training, and has a positive effect on body texture (increase muscle mass, burn fat). The use of by-products of grain processing, for example, oat bran with a fiber content (18.1–25.2 %), allows you to increase the content of not only dietary fiber, but also phenolic acids, flavonoids, oligosaccharides, proteins, folates, sterols, vitamins and minerals [5]. Inulin is an important ingredient with potential beneficial effects on human health, mainly due to its ability to counteract constipation and promote the growth of microflora in the digestive tract [6].

Market research data shows that by 2028, the protein bar market will grow to more than \$6 billion, including unsweetened protein bars. Thus, TM “EPIC Bars” has replenished the range of high-protein bars with offers based on meat and meat flavors. The Venison Sea Salt+Pepper bar is made from grass-fed venison [7].

Founded in 2012, Keto Bars was one of the first companies to create protein bars specifically for the keto diet with sweeteners [8]. BHU keto bars contain fiber from organic

tapioca flour [9]. “White Chocolate Macadamia Cookie Dough” contains baobab powder, “Dang Bars” contains chicory root fiber. No Cow Dipped Bars has the highest fiber content (11–15 g per serving) from corn. Keto Krisp offers a unique texture – crunchy, yet soft and chewy, containing marine collagen, MCT oil, and fiber up to 9 g per serving [10].

Therefore, we can conclude that bars made mostly from whole foods, such as oils, spices, natural sweeteners, nuts and seeds, should be preferred. If we are talking about items for the keto diet, that is, those that should contain a lot of fat, then healthy fats or raw materials with a high fat content should be placed in the prescription composition, namely, nuts and nut butter, MCT oil, avocado oil and flax, chia or hemp seeds.

In addition, as you can see from the above information, most bars contain a small amount of net carbs and are sweetened with sugar alcohols instead of added sugars (stevioside and erythritol), matcha, oat flour, which is a source of beta-glucan, which helps lower cholesterol and reduce the risk of heart disease.

Therefore, the information provided allows you to choose the direction of development of technologies and product lines, where it is better to give preference to products with a sugar content of no more than 10 g, at least 5 g of protein and 3 g of fiber per 1 serving. Such ratios will effectively maintain a feeling of satiety between meals.

Objectives of the article. The purpose of the article is an analytical study of modern trends in the formation of alternative portable food offers in the system of general improvement, using the example of protein bars with increased antioxidant activity and reduced sugar content. To achieve the goal, the following research methods were applied: analysis, synthesis, systematization and generalization of data. The methodological and theoretical basis of this study was made up of publications, informational messages from domestic and foreign sources.

Summary of the main research material. There are several categories of bars on the market, including those for sports nutrition. In each of these categories, several assortment lines can be distinguished, which differ both in shape (appearance of the finished product), type of packaging (appearance of the consumer form), and in ingredient composition, price, etc. With the available wide assortment, there are 2 directions for the formation of the ingredient composition. One is to select ingredients that can provide the body with nutrients to increase energy for exercise and performance. The second allows you to optimize recovery processes due to a set of biologically active substances.

Growing awareness of the benefits of protein bars is also driving overall sales. In 2021, the global market for protein bars was estimated at USD 4.55 billion. In 2023, the market will reach 4.83 billion US dollars. It is expected to reach USD 8.26 billion by 2032, growing at a CAGR of 6.15 % during the forecast period (2023–2032).

Hence, growing knowledge of the bars' health benefits and nutrient content that promotes tissue repair, reduces cravings for fast food, regulates blood pressure and helps with weight loss are some of the main factors driving

global demand and ultimately the market. Bars fortified with useful substances contain a powerful protective weapon for the organism – easily digestible protein of both vegetable and animal origin, which provides the body with an additional amount of energy and means of cell and tissue regeneration.

The market for these products is also expanding due to the fact that consumers consciously prefer ready-to-eat food or food substitutes – snacks. Protein bars have technological appeal for simulating nutrient content, such as those that regenerate damaged tissue as a result of protein and essential amino acid deficiencies. The demand for healthy, portable food is shaping advanced technologies for the development of ready-to-eat food products in small portions in one-time, convenient packaging.

Seeing the growing popularity of protein bars, the focus on reducing calories due to the content of carbohydrates, i.e. the need to reduce the amount of sugar, is becoming more and more relevant for companies – manufacturers of snack products of the specified range. It is the development of such technologies – high-protein bars with the label “sugar free” or “sugar 0 %” that will become a new growth vector of the market of food bars in the coming years.

An analysis of reliable sources revealed the reasons why the number of sales of protein bars is increasing, namely: for the purpose of increasing energy, for muscle growth and weight control. In addition, there is an increase in advertising and other means of marketing initiatives in fitness clubs and centers, points of sale of sports nutrition, including Internet stores of energy bars, as an alternative diet with an emphasis on healthy nutrition. It is expected that fitness clubs will become points of growth in demand for protein bars in the next 10 years.

In addition to the high protein content for building muscles or maintaining a good body shape, other nutrients can be added to the bars: amino acids, nuts, dried fruits, candied fruits, seeds, vitamins, minerals, fruit and berry purees and powders, plant extracts, biologically active substances – that is, it is possible to develop series where individual offers of the assortment line will have original properties due to a certain combination of nutritious, essential and biologically active compounds. For military

personnel, athletes, gym goers and people with a high level of physical work, protein bars are recommended to be consumed as a snack after hard training or work to maintain energy levels and increase productivity.

Another interesting one for expanding the range of protein bars, including vegan ones, are granola bars, which are made from ingredients such as oats, dried fruits, nuts, seeds, honey, coconut, chocolate chips, etc. In this regard, the nutritional value of granola bars differs significantly from the composition of the ingredients used.

Larabar Dark Chocolate Mind Nut and Seed Bar Quaker Chewy Dippes are the world’s most popular chocolate granola bars. Contains 200 and 400 cal respectively, protein 5/1 g, carbohydrates 13/23 g, sugars 7/13 g, fiber 4/1 g, fat 15/5 g.

Based on the results of monitoring other types of granola bars, it became known that granola bars are not only convenient, budget-friendly and portable, but also able to prevent overeating, as they consist of oats, nuts, seeds and dried fruits. Due to this, blood sugar levels are normalized and heart muscles are strengthened.

People strive to reduce food portions, but at the same time, try to consume only healthy calories, so large companies in the market, as well as other smaller competitors, in order to meet the unique needs of the population, see it necessary to invest in new technologies of innovative products, which are protein bars for healthy eating.

We conducted an analytical study of the existing protein bar markets, which resulted in segmentation by origin, type, and region. Thus, one of the main segmentation criteria was determined – on a plant-based and animal-based basis (that is, from plant protein and animal protein). Bars for sports nutrition (or people with heavy physical work and increased physical activity), snack bars are also distinguished.

In order to fully clarify the feasibility of developing protein bars for healthy eating, it became necessary to conduct a survey of projected consumers in order to obtain objective information about the attitude of the population and certain social groups to certain product characteristics, the development of which is described in this presented material. The results of the questionnaire are given in the table. 1.

Table 1 – Results of a survey of consumers as part of a study of their tastes and preferences of protein bars

| № | Questionnaire questions | Answers to the questions are presented | Percentage of responses, % |
|---|------------------------------------|--|----------------------------|
| 1 | 2 | 3 | 4 |
| 1 | Gender | female | 84 |
| | | male | 16 |
| 2 | How often do you buy protein bars? | daily | 64 |
| | | every other day | 28 |
| | | rarely | 8 |
| 3 | Your monthly income, in hrn? | up to 15000 | 10 |
| | | 15000–25000 | 26 |
| | | more than 25000 | 64 |
| 4 | Your age, in years | up to 25 | 19 |
| | | 25–50 | 74 |
| | | more than 50 | 7 |

| 1 | 2 | 3 | 4 |
|---|--|----------------------|----|
| 5 | Your preferences | with caramel | 4 |
| | | with seeds | 5 |
| | | with nuts | 6 |
| | | with honey | 3 |
| | | with milk chocolate | 23 |
| | | with dark chocolate | 28 |
| | | with white chocolate | 19 |
| | | with dried fruits | 7 |
| 6 | Are you interested in protein bars enriched with vitamin-mineral complexes and biologically active substances? | Yes | 90 |
| | | No | 10 |
| 7 | When buying protein bars, do you pay attention to the expiration date? | Necessarily | 12 |
| | | Sometimes | 78 |
| | | No | 10 |
| 8 | Have you consumed protein bars as a snack to improve your diet? | Yes | 9 |
| | | No | 91 |
| 9 | What weight would you be interested in the product? | 50 g | 11 |
| | | 75 g | 25 |
| | | 100 g | 64 |

Source: compiled by the authors

The results of the survey show that the majority of users of functional drinks are women aged 25 to 50, who consume protein bars every day. The monthly income level of the main number of consumers per family is (over UAH 25,000). To determine taste preferences, respondents' opinions were divided into 9 taste-aromatic groups, of which fillings from different types of chocolate – white, milk and black – were identified as the leaders.

From the results of the survey, it can be concluded that the consumer is interested in protein bars enriched with useful substances. Most consumers sometimes pay attention to the expiration date. It should be noted that 91 % of respondents were not yet familiar with protein bars. The majority of respondents are interested in the commercial form weighing 100 g (64 %).

As a conclusion, it is possible to define a portrait of a potential consumer, which was revealed on the basis of a survey: this is a woman aged between 25 and 50 years who will consume protein bars every day. The family income level is more than UAH 25,000 per month. At the same time, preference will be given to products with chocolate flavors, packaged in polymer packaging with a metallized insert weighing 75–100 g and with a long shelf life.

It should be noted that the majority of respondents were interested in this offer and expressed a desire to try a new product – a protein bar with a high fiber content, enriched with biologically active compounds, essential substances for healthy nutrition.

According to the terminology generally defined in foreign Western sources of information [2; 11; 12], bars with a high protein content (HPNB – High-protein nutrition bars) are a class of food products with a protein content of 15 to 70 %. Their main ingredient is protein powder, which mainly consists of whey protein, sodium casein or soy protein. In addition, lipids, sugar, water, fruit

and berry mixes, nut and seed compositions and flavorings are added to the composition. The technological process mainly consists of the following stages: preparation, mixing, molding and glazing. The water activity of HPNB is usually between 0.5 and 0.9, so HPNB can be stored at room temperature for a long time.

As an important factor in determining food consumption, food texture significantly affects consumer perception of a product and willingness to buy. HPNBs are prone to hardening during storage, which seriously affects the color, taste, consistency, nutrition, and other parameters of food, greatly limiting the shelf life of the product and the consumer experience of the food. Previous studies have shown that the curing of HPNB is a very complex process, which is usually divided into two stages: a preliminary stage, which usually involves physical changes between different components, such as phase separation, water migration, and protein self-aggregation, which begin to occur immediately after HPNB fabrication and play an important role in increasing hardness in the early stages of storage; late – a stage that occurs mainly after several weeks or months of storage, when the effect of storage conditions and protein aggregation, other processes caused by the Maillard reaction, leads to a significant increase in hardness [5].

In recent years, the processing and reuse of agricultural waste has attracted much attention. Food researchers are interested in re-entering the food chain of various agricultural wastes in order to combat the risk of food shortages and promote the use of high-value agricultural products.

Various effective methods have been tested to prevent hardening of HPNB, including protein modification, replacement of protein ingredients with protein hydrolysis products, and addition of polyphenols to inhibit the Maillard reaction. Although these methods relatively reduce the increase in hardness of HPNB after storage, they lead to

an increase in product cost due to the use of large amounts of plant extracts or chemical agents. Therefore, the use of raw ingredients belonging to industrial waste can be more economically beneficial to improve the physicochemical and nutritional value of HPNB than other various additives that increase its cost.

Ukraine also has technologies whose secondary processing products are protein-containing raw materials. For example, pumpkin seeds, sunflower seeds, hemp. It is such protein hydrolyzates that should be considered as a potential source of useful ingredients and the basis of high-protein bars.

Taking into account the above information, we have developed the basic principles of modeling the recipes of protein bars for healthy eating with the possibility of transferring the finished product to different statuses: for the fitness industry, athletes, military, the elderly, children, teenagers, students, office workers, heavy laborers, etc. The method of modeling the bars consisted in the fact that the ratio of the main macronutrients and fiber was developed to create general model recipes. For example, for high-protein bars, the P:F:C ratio should be: 18...21: 4...5: 15...18. In addition, it is possible to provide fiber in the composition – 1...3 g. The amount of saturated fats should not exceed 80 %, sugar – 17 %. For high-protein bars with a high content of dietary fiber (HPHF), the P:F:C ratio should be as follows: 19...20: 5...8: 18...25. Fiber – 3...15 g. The amount of saturated fat should not exceed 36 %, sugar – 3 %.

A number of suggestions of ingredients have been developed from which recipe compositions can be created:

1) for HP: protein mixture (milk protein isolate, whey protein isolate, whey protein concentrate), hydrolyzed collagen, glycerin, cocoa, water, maltitol, maltitol syrup, fractionated palm kernel oil, sugar, whey protein concentrate, milk (liquid, dry, condensed), unsweetened chocolate, cocoa butter, cocoa powder (alkalized), natural colors (including annatto and turmeric, added for color), partially defatted flour (seed, legume, nut), calcium salts, soy lecithin, butterfat, oils, sucralose, stevia, erythritol;

2) for HPHF: protein blend (milk protein isolate, whey protein isolate), soluble fiber, water almonds, erythritol, unsweetened chocolate, natural flavors, alkalized cocoa, cocoa butter, sea salt, sunflower lecithin, stevia, sucralose, bran, meal, fruit and berry powders, plant fiber.

A composition of four different protein sources was used to create the samples: whey protein isolate, milk protein isolate, and hemp and pumpkin proteins. All 4 protein powders were obtained in batches of 2 kg and were stored at +4...+6 °C throughout the study. Sucralose was used as a sweetener. Bars were prepared at 500 g for experimental industrial batches and at 65 g for laboratory samples for the study of sensory indicators of quality. The bars contained 15 g of protein per 65 g portion.

All ingredients were prepared according to the given technological scheme (Fig. 1). The prepared components were mixed with a mixer at low speed for about 3–4 min until a soft dough was formed. Fiber was adjusted for differences in mass when using non-food sweeteners. The resulting mass was manually rolled into bars approximately

10 mm thick and cut into pieces 80 mm long and 40 mm wide. Each 500 gram batch yielded approximately 9 bars at these sizes. All sensory tests were conducted according to the Instructions for organoleptic evaluation. A group of 6 people participated in the examination.

A preliminary sensory evaluation of 15 protein bar samples with different protein sources, protein content, and various amounts of sucralose sweetener was performed to determine the target sweetness intensity for the model bars. Milk powder, whey powder, hemp protein, sunflower seed hydrolyzate, pumpkin seed protein and their various combinations were used as a protein source, with a total protein amount of 15 g per portion of one packaged unit. The experimental design of the sweet taste consisted of 3 samples with a sucralose content of 0.017; 0.02; 0.025 g per portion of a bar of 62...65 g, which corresponded to 10, 12 and 15 g of sugar, respectively. Samples were served at 22 °C in 130 ml lidded souffle cups with a random 3-digit code. Each batch contained 3 bars, ranging from just noticeable sweetness to intense but not sweeter than the control (fourth on sucrose). A 5-minute break was established between examination of the samples, during which the participants were asked to rinse their mouth and stomach with deionized water. Paper ballots were used for grading. Tasters were asked to try each protein bar against a sucrose control protein bar in the order presented. Participants chose the sample that, in their opinion, was the most pleasant in terms of sweetness and taste [13]. Most of the high marks were given to the sample in which the content of sucralose in terms of sweetness was equal to 10 g per serving of 62...65 g.

The technological scheme of the production of protein bars with increased nutritional value is presented in fig. 1.

All raw components of the food mixture, auxiliary substances and fortifiers, which were used during laboratory and technological tests, had the appropriate quality certificates and regulatory documentation and were in the list of permitted components by the central executive authority in the field of health care for implementation in Ukraine.

Conclusions. The work outlined the technological aspects and analyzed the range of technologies of protein and high-protein bars, including those with an increased content of dietary fibers. According to the results of the analytical study, it became known that the content of the protein component should be no less than 12 g per serving, in high-protein bars – up to 25 g per serving. The dietary fiber content can range from 2 to 8 g per serving. The types, characteristics, assortment, approximate recipe compositions of protein bars were reviewed.

In the work, a marketing research of the market of protein and high-protein bars was carried out. The dynamics of the growth of this type of products as elements of portable nutrition with health-improving properties in the coming years are indicated. The results of a survey of predicted consumers are presented. Based on the results of the survey, a portrait of future consumers was created. The prospects for the development of the technology under development were identified according to the results of monitoring the sports and health food market, in particular protein bars.

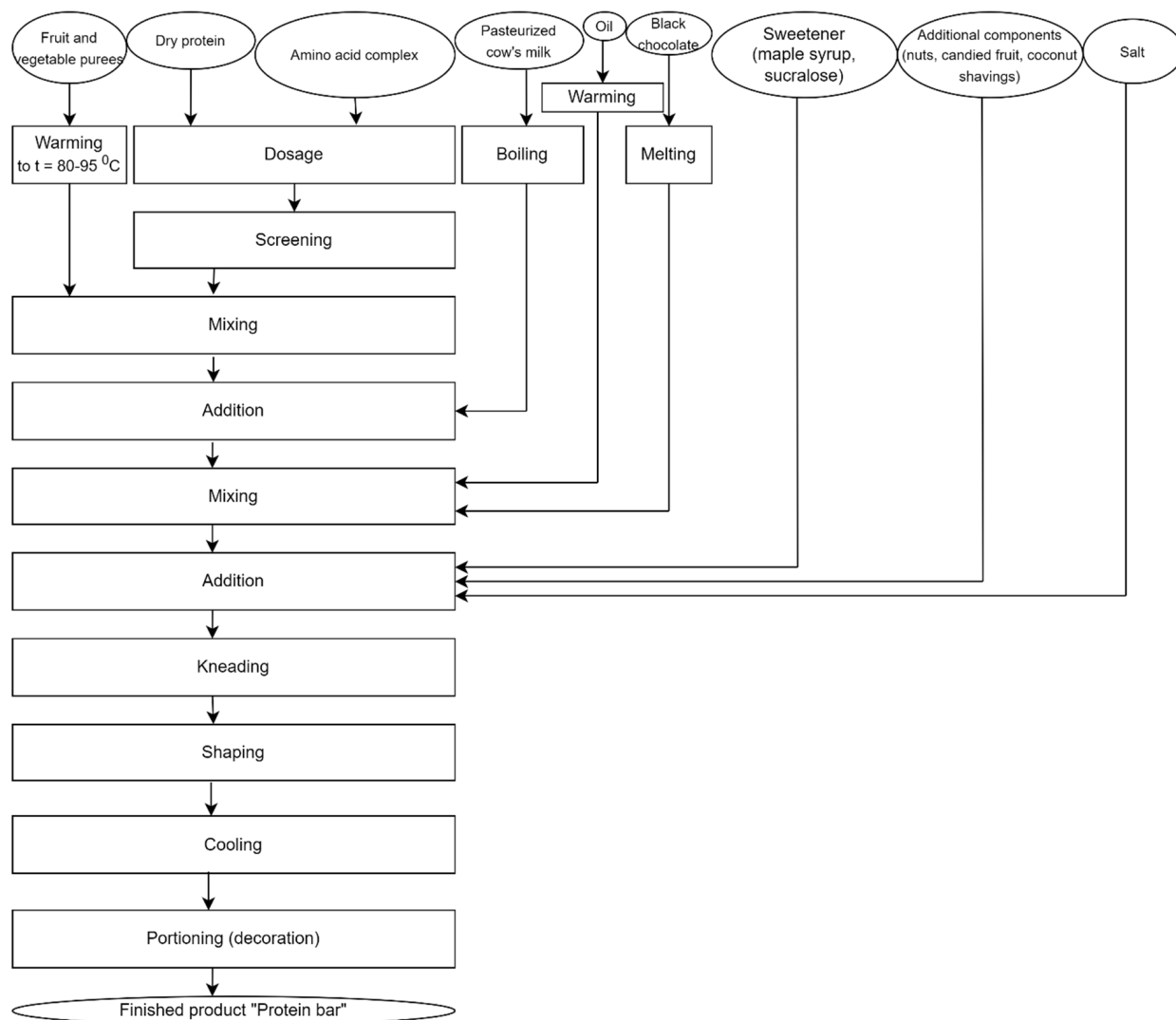


Figure 1 – Flow chart of the production of protein bars

Source: compiled by the authors

Taking into account the technological, physiological, physico-chemical properties of the components, their interaction with each other in the created technological food environments, the technology of protein bars enriched with plant extracts with antioxidant properties, amino acids that improve metabolic processes in the human body, vitamins and minerals that activate metabolic functions and restore life processes. Based on the results of the organoleptic evaluation, a model of the finished product weighing 62...65 g with sucralose sweetener in

the amount corresponding to 10 g of sucrose per 1 portion was derived. The model of the finished product is built on the ratio P:F:C for high-protein bars, should be: 18...21: 4...5: 15...18. In addition, it is possible to provide fiber in the composition – 1...3 g. The amount of saturated fats should not exceed 80 %, sugar – 17 %. For high-protein bars with a high content of dietary fiber (HPHF), the P:F:C ratio should be as follows: 19...20: 5...8: 18...25. Fiber – 3...15 g. The amount of saturated fat should not exceed 36 %, sugar – 3 %.

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ВИСОКОПРОТЕЇНОВІ БАТОНЧИКИ З ПІДВИЩЕНОЮ АНТИОКСИДАНТНОЮ АКТИВНІСТЮ ЯК АЛЬТЕРНАТИВНЕ ПОРТАТИВНЕ ХАРЧУВАННЯ В СИСТЕМІ ЗАГАЛЬНОГО ОЗДОРОВЛЕННЯ

Протеїни вважаються найважливішими макронутрієнтами для людського організму. Вони виконують багато корисних функцій: беруть участь у формуванні імунної системи на клітинному рівні, допомагають у синтезі ферментів, гормонів, білків плазми крові; синтезують антитіла, які протидіють збудникам хвороб; забезпечують організм енергією, перетворюючись при розщепленні на амінокислоти. Не дивлячись на те, що протеїни містяться у різноманітних харчових продуктах та сировині і поділяються на тваринні і рослинні білки, людський організм постійно відчуває нестачу білка, адже для повноцінного поповнення необхідно 100–150 г його щоденного споживання. Більшість білків приймають участь у процесах детоксикації від ксенобіотиків, ще частина має низький рівень засвоєння, це створює постійний дефіцит цих корисних компонентів харчування. Ринок протеїнових батончиків займає потужну нішу у багатьох сегментах харчування: оздоровчому, фітнес, дієтичному, вегетаріанському, спортивному, профілактичному, дитячому тощо. Батончики вважаються корисними перекусами і належать до альтернативного портативного харчування з метою підтримки вуглеводного, протеїнового, вітамінного, антиоксидантного, енергетичного балансу, швидкого тамування голоду та підвищення настрою. Деякі асортиментні позиції рекомендовані навіть для схуднення. Достовірно відомо, що споживання білка зменшує рівень гормону голоду греліну та допомагає природним шляхом зменшити споживання їжі. Слід зауважити, що далеко не усі протеїнові батончики виготовляються з корисних, так звано, “правильних” інгредієнтів. Важливою ознакою корисності – мінімального задоволення харчових потреб – вважається вміст не менше 8 г білка та 3 г клітковини на одну порцію. На сьогодні можна виділити кілька концепцій протеїнових батончиків, серед яких особливо переважають протеїнові батончики для схуднення, для тренувань (на різних етапах), енергетичні, міні-закусочні, портативні варіанти їжі, ідеальні (вискобілкові). Враховуючи унікальність протеїнових батончиків, беззаперечну актуальність їх виробництва, необхідно підкреслити те, що існує проблема невпорядкованості інформації щодо їх класифікації, рекомендацій щодо підбору інгредієнтів, споживання, критеріїв якості та безпечності виробництва.

Ключові слова: протеїнові батончики, здорове харчування, закуски, технологія.

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