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DEVELOPMENT OF A NEW KIND OF BREAD PRODUCED BY THE DEFERRED BAKING TECHNOLOGY ON THE BASIS OF MODERN METHODS OF QUALITY MANAGEMENT

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Abstract. The paper considers the use of the QFD (Quality Function Deployment) methodology in developing a new type of highly nutritive bread based on the deferred baking technology. The research has identified consumers' main requirements for the new product that directly affect its technical characteristics. By using quality management tools (affinity diagram, tree diagram, benchmarking, relationship matrix), the consumers' desires were translated into quantitative technical characteristics (design characteristics) of the product. The consumer requirements for a new type of bread have been ranked, and the weighting coefficients determined. A tree of product quality indicators characterising the level of consumer satisfaction has been formed, and their compliance with regulatory requirements has been established. To translate the consumer requirements into the quality parameters of the expected products, a House of Quality was constructed for the production of the new type of bread made by the deferred baking technology. It has been established that the naturalness of the newly developed product with high consumer properties should be achieved by using natural additives and high-quality raw materials, which will result in its high BAS content and extended shelf life. The QFD methodology will solve a number of problems posed by the deferred baking technology and allow creating a product with good sensory characteristics.

Key words: deferred baking technology, bread, quality, quality management, QFD methodology, marketing research.

Introduction. Formulation of the problem

Providing people with high-quality food is one of the main areas of any state's socioeconomic development. To solve this problem, one of the priority directions is the creation of health-improving products. The President of Ukraine's decree issued in 2019 "On the Sustainable Development Goals of Ukraine for the period until 2030" defines the improvement of nutrition as a strategic area of Ukraine's sustainable development. One of the common methods of improving nutrition is the development of scientifically based technologies to manufacture products with a certain recipe composition based on consumer preferences. First of all, this concerns the most traditional Ukrainian foods, and bakery products are among them.

Today's current trends include the deferred baking technology. It involves partial or no baking stage and the use of energy-saving technologies, which reduces power consumption and thus significantly decreases the production cost of semi-finished bakery products [1]. In 2021, the total market of frozen bakery products was estimated at U.S. $22.3 billion, and by 2026, it will reach U.S. $29.5 billion. Frozen bakery products are increasingly becoming an integral part of the daily diet all over the world, especially in European countries [2]. This is because people value their time and comfort more and more, which is especially noticeable in their attitude to cooking. For example, you only need 10–15 minutes to get a freshly baked bun from a semi-finished product. This is an already-formed trend with good prospects. The number of frozen products is going to grow exponentially, in particular, in Ukraine. On the domestic market, the main consumers of frozen semi-finished bakery products are catering establishments in the HoReCa and fast food segments. Frozen semi-finished products make it possible, without large investments, to increase by several times the range of products of a shop, supermarket, restaurant, café, bakery, to attract new visitors, to increase the income significantly [3]. So, it

is of current importance to develop of products using the deferred baking technology based on consumer preferences and thus provide people with a wide range of high-quality food. An effective method of translating consumer requirements into a new product's technical characteristics is the use of modern quality management methods, namely the quality function deployment methodology (QFD methodology). Using the quality function is a systematic approach to identifying consumer needs and wants, ranking them in terms of priority, and using proper planning when developing high-quality products to meet consumer preferences [4]. This methodology will allow a developer to offer a consumer a competitive product with unique consumer characteristics.

Analysis of recent research and publications

The deferred baking technology includes preparation of ready-to-mould frozen dough in blocks of the required weight, frozen shaped pieces of dough (ready for proofing and baking), partially baked semi-finished bakery products of various degrees of readiness, etc. The type of a semi-finished product depends on consumers' requirements. It can be retail chains, hotels, small shops for homemade bakery, cafés and restaurants, recreation centres, various fast food outlets, etc. The priority is the possibility of long-term storage of semi-finished products and the sale of freshly baked bakery products at any time of the day and as close to the consumer as possible. Thus, powerful factories can supply semi-finished products in small batches to be baked in the places of final sale. This technological option allows obtaining fresh and aromatic baked goods in minimum time at the very place where they are sold or consumed [1].

In recent years, scientists and manufacturers have been searching how to improve the technology of bakery goods based on frozen semi-finished products. To achieve better properties, efficiency, and storage characteristics of frozen dough, different additives are suggested: from those used in ordinary, non-frozen dough (emulsifiers, enzyme preparations, amylases, ascorbic acid) to less traditional substances such as alcohols and their derivatives, amino acids, etc. [1,5,6]. Frozen bread dough usually results in a smaller volume and a poor texture of bread due to dough slackening, and in reduced yeast viability. Scientists researched how the textural properties of frozen bread dough could be improved by using carbohydrate-active enzymes, α-amylase, and endo-xylanase. It was established that the combined use of α-amylase and endo-xylanase synergistically retarded bread hardening after 5 day's storage [7]. It was studied how the freezing rate and trehalose concentration affected the enzymatic and viscoelastic properties of dough and the quality of bread. The dough was prepared and trehalose was added in three concentrations (0, 400, 800 ppm); the dough was pre-fermented and frozen at two freezing rates and then stored for 42 days. High concentrations of trehalose (400 and 800 ppm) resulted in dough with the best viscoelastic and enzymatic properties. A larger bread volume and lower hardness were observed with slow freezing (-14°C/min) [8]. In the bakery industry, different processes and methods of freezing are used for breadmaking to preserve quality comparable to that of fresh bread. It was determined how the duration of part-baking, freezing rate, and frozen storage time affected the quality of part-baked French bread. The bread was part-baked for 0, 3, and 6 min, frozen at slow (0.15°C/min) and fast (1.75°C/min) freezing rates, stored under freezing conditions for up to 56 days, and thawed every 14 days. The results of the research showed that a relatively long time of partial baking leads to the formation of firm crumb, with limited damage to the structure, and thus allows obtaining bread of the optimal quality [9].

Despite the ongoing studies of manufacturing bakery products based on the deferred baking technology, there are shortcomings that decrease the quality of finished products:

– increased moisture loss during the technological process (first baking, freezing, storage of semi-finished products, final baking;

– possible sinking of the product and flaking of the crust after baking;

– use of improvers, most often those of inorganic origin;

– fast staling after final baking, lower yield of a product [10].

To solve one of these problems, we suggest replacing synthetic components with similar ingredients of natural origin, namely replacing the emulsifier with sunflower lecithin. It is also suggested that the following components should be added to the recipe: ascorbic acid (as oxidiser), malt flour, rice and soya bean flours, which are part of some improvers and increase the nutritional value and quality of products. The way we propose to decrease the moisture loss during the technological process (first baking, freezing, storage of semi-finished products, final baking) consists in improving the recipe by using different types and varieties of flour [11].

These data allow us to speak of the practical importance of developing new bakery products based on the "deferred baking" technology and promoting them to the consumer market due to their improved recipe composition. To ensure potential consumers' demand for the new products, we used the quality management methodology, namely the QFD methodology.

The main advantages of the QFD methodology, according to scientists in the field of management, lie in the fact that this method:

1. allows faster and deeper identification of consumer preferences;

2. is an effective and productive tool to improve the product quality;

3. reduces the cost of manufacturing a pilot batch of products (by 20–40%) and the cost of the preceding

development of a product (by more than 5 times);

4. forms the foundation for the analysis of competitiveness and product quality and provides information for managerial decision-making;

5. ensures the stability of the product quality;

6. provides a larger market share due to an earlier market launch of products higher in quality [4,12].

Initially, the method that allows translating consumer expectations into optimal technical characteristics was only intended to design complex products. This method is still little used in the food industry. The traditional approach to the development of new products is time-taking, laborious, requires a lot of experimental studies and expense. In contrast, QFD allows you to focus on the most important characteristics of the product-to-be, thereby reducing the costs and the period of bringing it to the market. The developer's or manufacturer's task is to transform the consumer's requirements into the product's quantitative technical characteristics with the help of quality management tools and methods. As a result, a consumer's requirements are deployed as technical requirements for the product, and then as its specific indicators. Only after that, the developer (manufacturer) can answer the question what needs to be done to meet the consumer's expectations for the new product [13,14].

The **purpose** of the study is using the QFD methodology to develop a new type of bread with increased nutritional value based on natural components by means of the deferred baking technology, taking into account consumer preferences.

For this purpose, the following **objectives** must be achieve:

– to identify the needs of potential consumers in order to convert their wishes into quantitative technical (design) characteristics of the product and build a House of Quality;

– to determine the priority areas of product creation, namely to identify the consumer benefits that must be taken into account when developing a new type of bread, in order to ensure potential consumers' demand for this product.

Research materials and methods

The development of a new type of bread with increased nutritional value was based on the QFD methodology that includes the following stages [13-16]:

1. determining the consumer requirements for new products;
2. ranking the consumer requirements;
3. grouping the quality indicators;
4. comparison of the quality indicators of the new products with those of a competitor's product;
5. listing the most important technical characteristics of the products under development;
6. translating the consumer expectations (requirements) into technical (design) product requirements;
7. studying the relationship between the consumer expectations and the parameters of the technical requirements for new products;
8. identifying how close the interaction is among the technical parameters, and visualising the strength of this interaction in a triangular correlation matrix;
9. developing a concept of the new product;
10. determining the target (planned) indicators of the quality of the new products.

According to this methodology, the first stage is the definition of consumer expectations for new products [4,15,16]. The Voice of the Customer technology was applied by surveying 50 potential consumers.

QFD includes the use of such quality management tools as the affinity diagram, the tree diagram, a scatter diagram, a benchmarking technique, a relationship matrix, etc. [14-16].

Certain target values can be the basis to calculated the "quality improvement degree" (for each of the product characteristics) according to the formula:

$$\text{Improvement Degree} = \text{Target Value} / \text{Quality Score} \quad (1)$$

Determining the improvement degree is followed by determining the weighting of each consumer expectation or each product characteristic. The weighting is calculated according to the formula:

$$\text{Weighting} = \text{Importance Rating} \times \text{Improvement Degree} \quad (2)$$

The numerical estimates of the significance of the strength of relationships, of each technical characteristic of the new product, which are given in the cells of the relationship matrix, are calculated according to the formula:

$$\text{Significance of Relationships} = \text{Strength of Relationships} \times \text{Weighting} \quad (3)$$

When developing a new type of bread produced by the deferred baking technology, we used the following materials: flour (top-grade wheat flour, cornmeal, buckwheat, malt, soya bean, and rice flours), table salt, wheat bran, pressed baker's yeast, drinking water, sunflower lecithin, ascorbic acid. The composition of the improver included rice, malt, and soya bean flour, an emulsifier (lecithin), and an antioxidant (ascorbic acid). The laboratory bread baking was carried out using the straight dough procedure. The products were cooled and put in the freezer at -18 °C for 240 minutes. The products were stored under the same conditions for 3 days. The thawing stage took place at 29–32 °C. The duration of the final baking was 30% of the remaining baking time. Products made by the traditional technology were used as control samples [1].

Results of the research and their discussion

Consumers' satisfaction is the main point and prerequisite for the competitiveness of enterprises in today's consumer market. However, at present, a consumer's mere satisfaction can but rarely create a lasting attachment to a product of a certain manufacturer. To have a regular customer, a manufacturer needs to know what the consumer wants [14]. This is especially important when developing new food products. The development of new high-quality products and the stable operation of food industry enterprises guarantee people's well-being, their adequate food supply, and, significantly, the country's food security.

The development of a new type of bread, with increased nutritional value, made by the deferred baking technology involved using the quality function deployment methodology. The first stage according to this methodology is the definition of consumer expectations by means of the Voice of the Customer technology [4,15,16]. Fifty potential consumers answered the open question, 'Please, list your wishes for the quality of a new type of bread, with increased nutritional value, made by the deferred baking technology.' Based on the results of the survey, a list of consumer requirements for expected products was established. However, since consumers formulated their wishes in an abstract form, at the further stage of processing the information received, all consumer requirements were specified, simplified and particularised. An affinity diagram and a tree diagram were used for this.

Based on the affinity diagram, all requirements expressed in the "consumer language" were structured, namely systematised and processed, and the duplicate and conflicting requirements were identified [14]. As a result, the requirements significantly decreased in number, because the identical requirements were removed and the similar ones generalised. For example, a consumer wants bread "high in fibre," "high in dietary fibre," "high in protein," "high in minerals," "low in carbohydrates," etc. On processing this information, the requirements were structured and summarised into a "balanced chemical composition."

However, it is impossible to create a new product that would meet all consumer requirements. So, it is necessary to know which requirements must be satisfied and which ones can be neglected to some extent [14-16]. In this regard, the next stage is the ranking of the consumer requirements received. For this, another 50 respondents were recruited. Unlike the first survey, now the focus group included specialists in bread production (manufacturers, developers, scientists). The moderator asked to rate the importance of the consumer requirements on a ten-point scale. All suggestions were grouped by the level of importance or by the rating. The rating was determined by comparing the number of suggestions for each indicator from the list of consumer requirements. Using a scatter plot allowed identifying paired data and the most significant consumer requirements. The highest rating, according to the results of the focus group survey, is that of the indicators "taste of the product," "freshness," "natural composition of the product," "balanced chemical composition," "safety." The last five indicators include the following: "dark cream colour," "high calorific content," "presence of improvers," "preservatives, colouring agents, flavourings added," "nice packaging." According to the results of the rating, the consumer requirements with the lowest average rating, i.e. the ones that can be ignored, were excluded.

Then, with the help of a tree diagram, all requirements were structured and divided into groups. As a result, a three-level structure "Tree of quality indicators" was developed (Fig. 1). Later, it was used to form the concept of a new product. The first level of the diagram displays the generalising characteristics (consumer properties) of the new product. At the second level, the quality indicators are defined. At the third level, consumer requirements for each quality indicator of the new bread type are determined. They are listed in the Table 1.

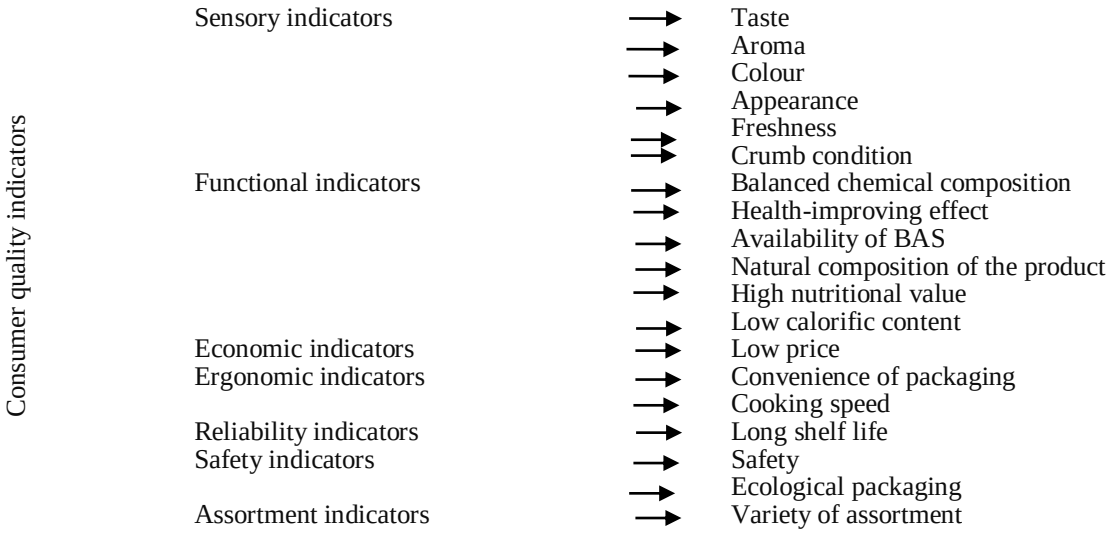

Fig. 1. Tree of the quality indicators of the new type of bread made by the deferred baking technology according to consumer preferences

Table 1 – Quality indicators of the new type of bread made by the deferred baking technology

Quality indicators	Characteristic of the desirable quality indicators of the new product
Taste	The taste of the product should be pleasant, characteristic of this type of bread. When chewing bread, there should be no crunch on the teeth, which indicates the presence of sand, earthy parts, and other mineral impurities in the bread.
Smell, aroma	The aroma of the product should be pleasant, characteristic of this type of product, with the smell of the additives used, without mustiness and other off-odours.
Appearance (shape, surface condition, colour of the crust)	Bread should have a certain shape. Pan bread has the shape of the mould it was baked in, with the slightly convex upper crust. Oven-bottom bread should have a regular shape, round, oval, or oblong-oval. Bread with defects (dented, deformed, loose-shaped) is not allowed. The surface of simple bread should be smooth, without large cracks and oven breaks. Large cracks are those that pass through the entire upper crust in one or more directions and are more than 1 cm wide. Oven breaks are considered large if they run along the entire length of one of the sides of the loaf or along more than half its circumference and are wider than 1 cm (in a pan loaf) or 2 cm (in oven-bottom bread). The crusts should be evenly coloured: brown or light brown in rye bread varieties, lighter in places of cuts or lubricants, and quite evenly coloured, light brown or dark golden in wheat bread varieties.
Freshness	The freshness and staling rate must be in accordance with the type of products, the type of flour the bread is made from, recipes, weight of the products, storage conditions, manufacturing technology, etc. These factors determine the sell-by dates of products: for rye and rye-wheat bread, not more than 36 hours after manufacturing; for wheat bread, not more than 24 hours; for smaller baked products, not more than 16 hours. After this storage period, the bread is considered stale (not fresh) and cannot be sold in retail chains.
Crumb condition	The crumb should be absolutely uniform, well-developed, thin-walled. A product should have well-loosened crumb with many thin-walled pores, which is easily soaked by gastric juice and thus better absorbed by the human body. The pores should be evenly distributed throughout the crumb and should not be too large. Hardenings (dense, non-porous areas) in the crumb are not allowed. The crumb is characterised by thoroughness of mixing, the appropriate degree of doneness, elasticity, porosity. It should have no lumps of unmixed flour and pieces of salt. The crumb of the bread should be completely baked, not sticky, and not wet to the touch. It should be elastic enough: being lightly pressed with fingers, the crumb should regain its original shape.
Health-improving effect	When consumed, the product should have a health-improving effect on the consumer.
Balanced chemical composition	The product should have a well-balanced chemical composition (by the content of proteins, carbohydrates and fats).
Availability of BAS	The product must have a balanced BAS content.
Natural composition of the product	The product must be based on natural components, contain no preservatives, artificial flavours, and colouring agents.
High nutritional value	The product must satisfy a consumer's physiological needs in essential nutrients and energy.
Affordability	Low price of the product
Convenience of packaging	Convenience of opening the package
Cooking speed (at sales outlets or at home)	The cooking time (until ready) is 5–45 minutes, depending on the type of frozen semi-finished product.
Long shelf life	The shelf life of the semi-finished product at -23 ° – 30 °C is about 6 months.
Safety	The product must be completely safe in terms of its microbiological indicators and the content of toxic elements, mycotoxins, radionuclides, residual amounts of pesticides
Ecological packaging	Packaging must meet modern packaging requirements and be environmentally-friendly.
Variety of assortment	A wide range of new types of bread based on natural components and with improved consumption properties

The subsequent survey of a focus group allowed establishing the weighting coefficients of the above quality indicators on a five-point scale (Fig. 2): 5 – very valuable, 4 – valuable, 3 – less valuable, but good to have; 2 – not very valuable; 1 – of no value [4]. The rating of consumer requirements has shown that in the new bread, the features most important to consumers are: the improved taste characteristics of the product; freshness, pleasant aroma and taste, well-balanced chemical composition, safety; the health-improving effect on a consumer; the natural composition of the product and, of course, the speed of cooking until ready at sale outlets or under household conditions. The results of consumer requirements and their priorities are entered in special columns of the House of Quality (Fig. 2).

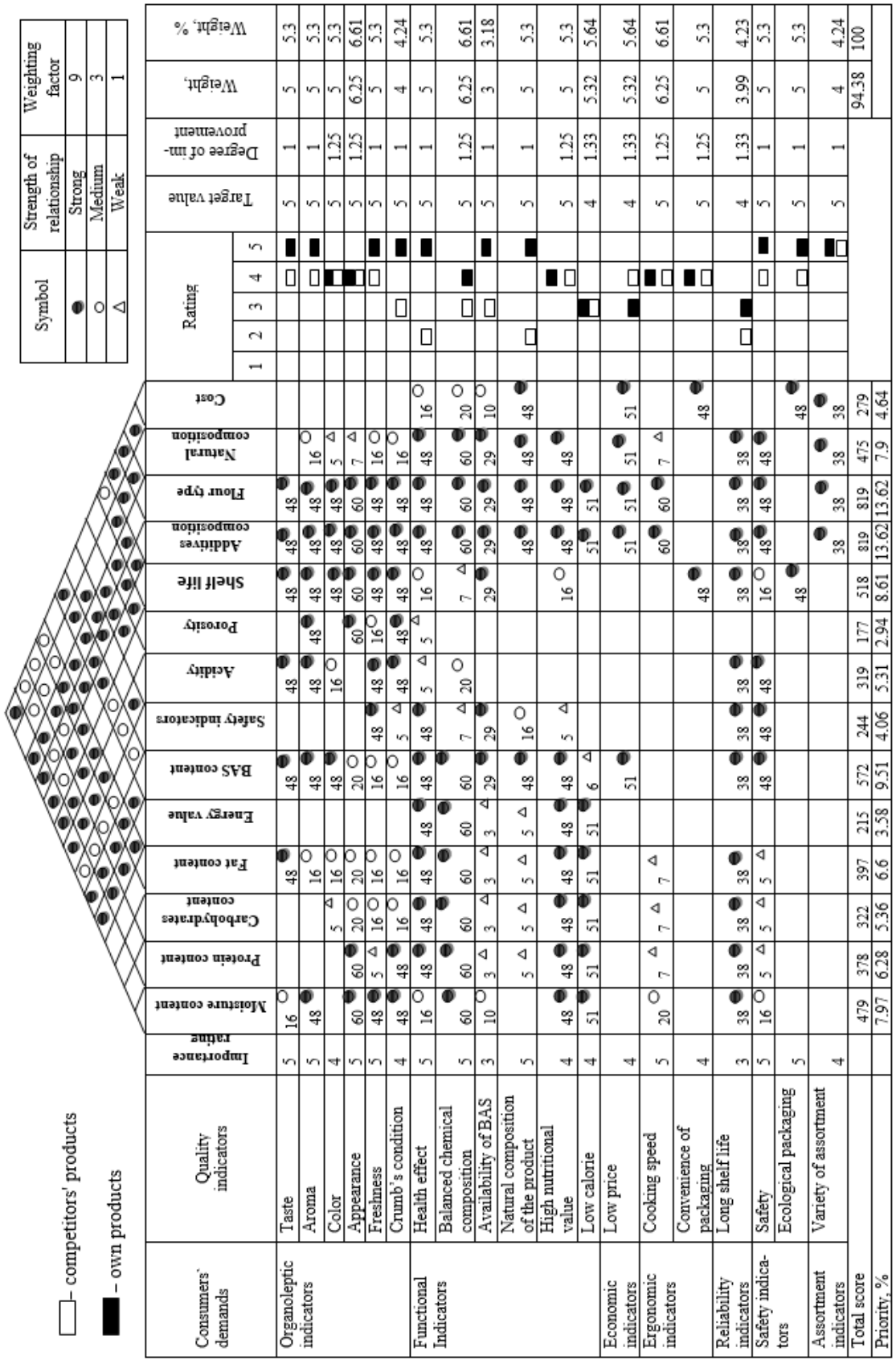

Fig. 2. House of Quality for designing a new type of bread produced by the deferred baking technology

According to QFD, the next stage was benchmarking in order to compare the quality indicators of the new products with those of competing types of products [4]. This results in understanding how the product developed will compete with the best analogues present on the market. In the course of benchmarking, the focus group used a five-point scale from "excellent" to "poor": 5 – excellent, 4 – good; 3 – satisfactory (generally meets the standard); 2 – not very satisfactory (meets the standard but partially); 1 – poor (does not meet expectations). The results of this comparison are presented in the "veranda" of the House of Quality (Fig. 2). The competing product was selected based on market analysis and consumer surveys. As a result, bread made by the deferred baking technology from *METRO Chef*, which is sold in the relevant retail chains of Odesa, was chosen as the product for comparison. The technical characteristics of the competitor's product were analysed with the help of information from the labelling and regulatory documentation for the product. The results for the "degree of improvement" and "weighting" calculated according to the formulae 1 and 2 are shown in the "veranda" of the House of Quality (Fig. 2).

At the fifth stage, based on literary sources, market analysis, and current consumer preferences for bread made by the deferred baking technology [1,2], the product's most important quantitative technical parameters and characteristics were listed and included in the "ceiling" of the House of Quality (Fig. 2). The consumer expectations were translated into the "language" of quantitative technical parameters and product characteristics by brainstorming the focus group. The group moderator was tasked with determining which consumer expectations can be used to gain competitive advantage. To establish the strength (power) of the relationships between the consumer requirements and the technical characteristics, a relationship matrix was constructed (it is shown in the central "room" of the House of Quality). An empty cell in the matrix indicates no relationship between consumer expectations and technical characteristics of products. If there is a relationship, a symbol is entered in the cell to indicate how strong this relationship is [14-16]. Besides, for each characteristic, according to the formula 3, a criterion was calculated. It takes into account the value of the strength of the relationship between a certain characteristic and the priority of requirements that was established by the consumers. As can be seen, converting the consumer requirements into technical characteristics has shown that the balanced chemical composition of the product depends primarily on its chemical composition (moisture content, protein, carbohydrates, fat, BAS, calorific value, type and composition of additives, grade and type of flour, and naturalness of the initial components) (Fig. 2). Good appearance is most affected by the mass fraction of moisture and protein in the products, porosity, shelf life, type and composition of additives, grade and type of flour.

At the next stage, the total assessment of the quantitative indicators was carried out and their priority was determined, taking into account their importance rating and the strength of relationship between consumer requirements and quantitative indicators. The priority of each technical parameter (expressed as a percentage) was found as the ratio of its total evaluation to the sum of all total evaluations of the technical parameters. The data obtained were further used when filling the "basement" of the House of Quality (Fig. 2), namely when calculating the priority of the product under development. Based on the results of the calculation, it has been established that when developing a new type of bread made by the deferred baking technology, it is necessary, first of all, to pay attention to the technical (design) characteristics with the highest priority, since they meet the wishes, which are the most important to consumers. The top priority characteristics when developing a new product are: type and composition of additives used to improve the quality of the finished product (13.62%), grade and type of flour (13.62%), shelf life (8.61%), BAS content (9.51%), moisture content (7.97%), naturalness of the initial components (7.9%). When developing a new type of bread, attention should be paid to these technical characteristics in the first place, because they are strongly connected with most requirements of potential consumers.

On the basis of the QFD results obtained, the recipe composition of a new bread type has been developed (Table 2). So, it has been proved that different types and varieties of flour (buckwheat flour, cornmeal, and wheat bran) can be used, which helps meet potential consumers' basic requirements to the new type of bread produced by the deferred baking technology. The study of consumers' preferences and requirements to bakery products allows us to conclude that these objectives can be achieved by using natural components, namely lecithin powder and various types and grades of flour. In the future, it is planned to study the sensory characteristics of the types of bread proposed, as well as to investigate how using buckwheat flour, cornmeal, and wheat bran affects the moisture loss in products during the first baking, freezing, storage of semi-finished products, and final baking, and how they reduce the intensity of staling of bread during cooling. The use of these types of flour and wheat bran, besides increasing the nutritional value of products, will also allow solving a number of problems characteristic of the deferred baking technology, thus preventing the use of improvers that have a negative effect on the human body.

Thus, the development of a new type of bread, with increased nutritional value, made by the deferred baking technology taking into account the QFD results will allow obtaining a product that will be competitive on the market, because its consumption properties will satisfy the target group of consumers.

Table 2 – Recipes of the new types of bread manufactured using the deferred baking technology (for 300 g of flour)

Raw material	With buckwheat flour	With cornmeal	With wheat bran	Moisture content of the raw material, %
Top grade heat flour	270	270	270	14.5
Buckwheat flour	30	–	–	14.5
Cornmeal	–	30	–	14.5
Wheat bran	–	–	30	14.5
Table salt	4.5	4.5	4.5	3.0
Pressed baker's yeast	12.0	12.0	12.0	75.0
Improver	9.0	9.0	9.0	-

Conclusion

1. On the basis of marketing research, potential consumers' main requirements for the new type of bread produced using the deferred baking technology have been identified. It has been established that the features consumers find the most important are the product's improved taste characteristics, safety, balanced chemical composition, the health-improving effect when the product is consumed, naturalness of the composition, and, of course, the cooking speed under household conditions. By using quality management tools (affinity diagrams, tree diagrams, benchmarking, relationship matrix), the consumer wishes have been translated into quantitative technical characteristics of the product, and the House of Quality has been constructed.

2. It has been established that when developing a new type of bread, with increased nutritional value, produced by the deferred baking technology, it is necessary to ensure the naturalness of the product and improve its taste characteristics. This is possible by using natural additives and high-quality raw materials, which will lead to a product with an increased BAS content and an extended shelf life, and, most importantly, it will allow creating a product with good sensory indicators. The use and wheat bran allows not only to increase the nutritional value of the products, but also to solve a number of problems characteristic of the deferred baking technology, preventing the use of improvers that have a negative effect on the human body. The use of different types of flour (buckwheat flour, cornmeal) and wheat bran, besides increasing the nutritional value of products, also allows solving a number of problems characteristic of the deferred baking technology, thus preventing the use of improvers that have a negative effect on the human body.

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РОЗРОБКА НОВОГО ВИДУ ХЛІБА, ВИРОБЛЕНОГО ЗА ТЕХНОЛОГІЄЮ «ВІДКЛАДЕНОГО ВИПІКАННЯ» НА ОСНОВІ СУЧАСНИХ МЕТОДІВ МЕНЕДЖМЕНТУ ЯКОСТІ

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Анотація. У статті розглядається використання QualityFunctionDeployment – методології при розробленні нового виду хліба підвищеної харчової цінності за технологією «відкладеного випікання». У ході досліджень визначено основні вимоги споживачів до нового продукту, які безпосередньо впливають на його технічні (проектні) характеристики. Шляхом використання інструментів менеджменту якості (діаграми афінності, деревоподібної діаграми, бенчмаркингу, матриці зв'язків) проведено перетворення побажань споживачів у кількісні технічні (проектні) характеристики продукту. Проведено ранжування споживчих вимог до нового виду хліба, визначено коефіцієнти вагомості. Сформовано дерево показників якості продукту, що характеризують рівень задоволеності споживачів. Для перетворення вимог споживачів в параметри якості очікуваної продукції побудовано «Будинок якості» для виробництва нового виду хліба за технологією «відкладеного випікання». Встановлено, що при розробці нового продукту з підвищеними споживними властивостями необхідно забезпечити натуральність продукту, за рахунок використання натуральних добавок-поліпшувачів та високоякісної вихідної сировини, що забезпечить отримання продукту з високим вмістом біологічно активних речовин та пролонгованим терміном зберігання. Використання методології розгортання функції якостіприрозробці нового виду хлібадозволить вирішити ряд проблем, характерних для технології «відкладеного випікання», а також забезпечить створення продукту з гарними органолептичними показниками.

Ключові слова: технологія «відкладеного випікання», хліб, якість, менеджмент якості, QFD-методологія, маркетингові дослідження.