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Д.В. Сокольский атындағы «Жанармай,  
катализ және электрохимия институты» АҚ

# Х А Б А Р Л А Р Ы

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## ИЗВЕСТИЯ

НАЦИОНАЛЬНОЙ АКАДЕМИИ НАУК  
РЕСПУБЛИКИ КАЗАХСТАН  
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## NEWS

OF THE ACADEMY OF SCIENCES  
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**M.K. Kassymova<sup>1</sup>, Z.I. Kobzhasarova<sup>1</sup>, G.E. Orymbetova<sup>1</sup>, G. Nurymbetova<sup>1</sup>, Anita Blija<sup>2</sup>**<sup>1</sup>M.Auezov South Kazakhstan State University, Shymkent, Kazakhstan;<sup>2</sup>Latvian University of Agriculture, Jelgava, Latviae-mail: [mahabbat67@mail.ru](mailto:mahabbat67@mail.ru);**USE SUNFLOWER OIL PRODUCED BY JSC «SHYMKENTMAI» AT THE DEVELOPMENT OF TECHNOLOGY OF EMULSION PRODUCT**

**Abstract.** On the basis of the conducted researches on factors of formation of consumer properties of emulsion products, recipes and technology of low-calorie emulsion sauces have been developed.

On the basis carried out of the studies the factors of the formation of consumer properties of emulsion products of special purpose, recipes and technology for obtaining low-calorie emulsion sauces were developed.

The expediency and effectiveness of the use of deodorized refined vegetable oils of JSC "Shymkentmai" were substantiated.

An organoleptic evaluation of the experimental emulsion products were carried out in comparison with the traditional ones, which were evaluated according to the following parameters: appearance, consistency, odor and taste. It has been established that a of fat content 35% emulsion product on the basis of sunflower oil produced by JSC «Shymkentmai» with a plant additive were characterized by a higher value of the total quality index due to the delicate taste and absence of foreign flavors.

It is revealed that the calorie content of the new emulsion product is significantly reduced by reducing the prescription amount of vegetable oil, while maintaining high organoleptic parameters. Low amounts of protein in the formulations of the new emulsion product should be considered as a positive moment, as emulsion product is a sauce that is served to the main dish, including meat, fish and poultry.

**Key words:** emulsion product, functionality, sunflower oil, consumer value.

**Introduction.** The market for fat products is constantly expanding due to new products developed in accordance with the latest achievements and recommendations of the science of nutrition. Great opportunities for the development of the range of mayonnaise and mayonnaise sauces are associated with an increase in their food value and a decrease in energy value due to a directed change in the formulation composition, with the perfection of the fat phase, the introduction of vitamins, minerals, dietary fiber and other physiologically functional food ingredients [1-4].

The production of fatty products, including emulsion, for the nutrition of various population groups with a balanced complex of biologically active substances: lipids, fatty acids, proteins, vitamins and minerals, is possible on the basis of the development of effective methods for processing vegetable oils produced by JSC "Shymkentmai".

However presently presented at the home market the assortment of mayonnaises and mayonnaise sauces on the basis of vegetable oils produced by JSC "Shymkentmai" for the healthy eating very were limited.

The necessary conditions for the production of emulsion products of a functional purpose are [5-7]:

- the use of high-quality vegetable oils, which allow obtaining high-quality products;
- use of non-traditional types of emulsifiers (wheat germ);
- the use of vegetable additives (powder from jid).

In this regard, the development of new formulas for emulsion sauces with low calorie content is topical, since their emulsion nature allows not only to enrich the product with a large number of biologically active additives intended for replenishment of essential substances (essential nutritional

factors) in the body, but also to reduce caloric content by replacing sugar sweeteners of plant origin, as well as get a tasty product, useful for the health of all population groups [8-11].

**The aim of the work** is to study the use of sunflower refined oil produced by JSC "Shymkentmai" in the development of an emulsion product for functional purposes.

Objects and methods. **As research object, the refined and unrefined deodorized oils (produced by JSC "Shymkentmai"), emulsive sauce, were chosen.**

At the carrying out of researches applied the generally accepted, standard methods of determination of physical and chemical properties of raw material and ready products. The colored was determined by the method of determination of the colored number with the use of Lovibond colorimeter according to QOST 5477-93 [12]. Determination of viscosity of the food emulsive systems were carried out on the rotary viscometer-stirrer of " Rheotest -2".

Rheotest is a rotary viscometer-stirrer, suitable for realization of more exact rheological researches of non-newtonian liquids. The test temperature can be regulated a wide range by temperature control. Rheotest is characterized the scientifically-reasonable principle of measuring, and also wide range of measuring of moving tension, speed of change and viscosity [13,14].

The use of water-fat emulsions is most preferable, since it helps stabilize the physiological functions of the human gastrointestinal tract and is easily digestible. In addition, this is one of the possible ways to optimize the fat diet and nutrition structure of the population of Kazakhstan at the expense of developing new types of sauces [15,16].

**Results and discussions.** When developing the formulations of the emulsion fat product, as a fat basis, were used the refined deodorized and unrefined sunflower oils, produced by JSC "Shymkentmai".

Organoleptic and physicochemical parameters of refined deodorized and unrefined sunflower oils are given in tables 1 and 2.

Table 1 - Organoleptic characteristics of refined deodorized and unrefined sunflower oils

Indicator name	Characteristics of sunflower oil	
	unrefined sunflower oils	Sunflower refined deodorized oil "High grade"
Transparency	Sediment and light turbidity or «grid» over sediment allowed	Transparent without sediment
Smell and taste	Characteristic of sunflower oil, without foreign smell, smack and bitterness	Without smell, impersonal taste

Table 2 - Physicochemical parameters of refined deodorized and unrefined sunflower oils

Indicator name	unrefined sunflower oils	Sunflower refined deodorized oil "High grade"
Color number, Mg of iodine, no more	15	6
Acid number, mg KOH/g, no more	1,5	0,30
Mass fraction of non-fatty impurities, %, no more	0,05	Absence
Mass fraction of phosphorus-containing substances, %, not more than:		Absence
in terms of stearoololeucitin	0,20	
in terms of P <sub>2</sub> O <sub>5</sub>	0,018	
foam ( qualitative test )	0,15	Absence
Mass fraction of moisture and volatile substances, %, no more	Not standardized	0,10
Flash point of extraction oil, °C, not less	Not standardized	Not standardized
Peroxide number, mole of active oxygen / kg, no more	Not standardized	4,0
An anisidine number, no more	7,0	3,0

The acidic and peroxidic numbers of the oil under investigation meet the requirements for the permissible levels of oxidative damage for unrefined oils in accordance with TR 1556-1958-AO-016-2017 [17].

Due to the complete conformity of organoleptic and physicochemical parameters of vegetable oils to the characteristics and values recorded in the normative and technical documentation for this type of

product, the above oils were used for the preparation of experimental and control samples of mayonnaise sauce. It should also be noted that the peroxide number of oils in both cases does not exceed 1.0 mmol ( $\frac{1}{2}$  O) / kg, which indicates a high quality of raw materials and its suitability for the preparation of emulsion products.

Proceeding from the foregoing, the refined deodorized sunflower oil produced by JSC "Shymkentmai" is the most preferred raw material for the production of mayonnaise sauce with improved consumer characteristics.

In laboratory conditions samples of a emulsion product of fat content of 35% with used of the refined sunflower oil produced by JSC "Shymkentmai" were developed.

An organoleptic evaluation of the experimental emulsion products were carried out in comparison with the traditional ones, which were evaluated according to the following parameters: appearance, consistency, odor and taste (table 3).

To assess the organoleptic characteristics of model compositions of emulsion product, a 5-point scale was used.

Table 3 - Organoleptic quality indices of emulsion product

Indicators	An experience	Control	Average Score	
			An experience	Control
Appearance, consistency	Homogeneous creamy, with single air bubbles	Homogeneous creamy, slightly stretched with single air bubbles	4,99	4
Taste and smell	Delicate taste, sour, without bitterness, with the smell and smack of jid and citric acid	Pleasant, slightly pungent and sour taste, with a slight smell and taste of unrefined sunflower oil, mustard and citric acid	4,98	3,8
Color	Bright yellow, homogeneous throughout the mass	White, homogeneous throughout the mass	5	4,5

Based on the results obtained, emulsion product with a fat content of 35% based on sunflower oil produced by JSC "Shymkentmai" with a vegetable additive is characterized by a higher value of the total quality index due to a delicate taste and the absence of foreign flavors. The control sample of mayonnaise is perceived more acidic, and notes of the original oil are felt in the taste.

Physicochemical parameters of a mayonnaise sauce fat content of 35% on the basis of sunflower oil produced by JSC "Shymkentmai" with a plant additive (table 4) were studied.

Table 4 - Physical and chemical parameters of the emulsion product of fat content of 35% on the basis of sunflower oil produced by JSC "Shymkentmai" with vegetable additive

Indicator name	An experience	Control
Moisture content, %:	52,5	50,5
Acidity in terms of acetic acid, %	0,35	0,6
Emulsion stability, % undamaged emulsion	100,0	98,0
Effective viscosity at 20°C, Pa*c	13,6	11,8

The data obtained, summarized in tables 3 and 4, indicate that the samples of products comply with GOST R 53590-2009 and GOST 31761-2012 in all respects. It was found that the experimental samples of the emulsion product were better in all respects than the control samples.

We analyzed food and energy value of emulsion product (table 5).

Table 5 - Food and energy value of emulsion product (per 100 g of product)

Indicator name	Indicator value
Proteins, g	1,0
Fat, g	35,0
Carbohydrate, g	1,8
Energy value, kkal/100 g	326,2



Caloric content of the new emulsion product is significantly reduced by reducing the prescription amount of vegetable oil, while maintaining high organoleptic parameters. Low amounts of protein in the formulations of the new emulsion product should be considered as a positive moment, as the emulsion product is a sauce that is served to the main dish, including meat, fish and poultry [18-20].

The mineral and vitamin composition of the emulsion product were also determined, which is presented in table 6.

Table 6 - Mineral and vitamin composition of the emulsion product

Product name	Vitamins, mg/100 g			Mineral substance, mg/100 g				
	A	E	$\beta$ -carotin	K	Na	Ca	Mg	Fe
Emulsion product	7,0	0,48	4,0	63	513	57	11	0,4

According to the data presented in table 6, it can be concluded that the emulsion product has a balanced chemical composition: a reduced amount of fats; have a positive effect on the physiological processes of the body.

One of the important consumer properties of food is the safety property.

In accordance with GOST R 53590-2009, mayonnaise and emulsion products should be stored at the manufacturer and the consumer in warehouse, commercial refrigerated rooms or refrigerators with air circulation, at a temperature not lower than 0 ° C and not higher than 10 ° C. It is not allowed to storage mayonnaises and emulsion products in direct sunlight [21].

Decrease in consumer properties of emulsion product was studied, analyzing the dynamics of changes stability and, organoleptic indices.

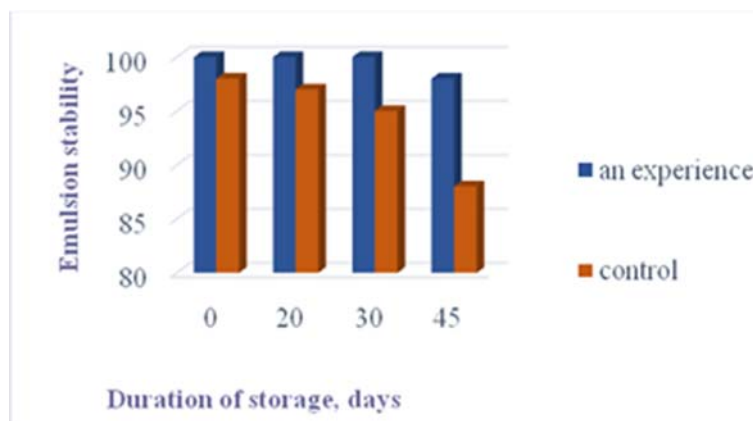
To reveal the dynamics of changes in the quality characteristics of the developed products, they were packaged in polymer cups weighing 250 g and stored at a temperature of 10 ° C and relative humidity of not more than 75% for 45 days. Storage modes were chosen in accordance with the requirements of GOST R 53590-2009, taking into account that 10 °C is the maximum permissible. The dynamics of change in the quantity of emulsions of control samples and the developed products is presented in the table 7 and in figure.

Table 7 - Physicochemical parameters of experimental and control batches of low-calorie products and their change during storage.

Indicator name	Indicator value	
	Control	An experience
freshly worked		
Emulsion stability, %, undamaged emulsion	98	100
After 20 days storage at temperature of 10 °C		
Emulsion stability, %, undamaged emulsion	97	100
After 30 days storage		
Emulsion stability, %, undamaged emulsion	95	100
After 45 days storage at a temperature of		
Emulsion stability, %, undamaged emulsion	88	98

Analyzing the dynamics presented in figure 1, we can conclude that the emulsion product with jid powder and wheat germ flour are more resistant to storage than the comparison samples. Based on the fact that according to the norms the emulsion stability is not less than 97%, the shelf life of the mayonnaise with a mass fraction of fat of 35% at a temperature of 10 ° C. Thus, the shelf life of the emulsion product is up to 45 days.

The conducted researches showed that low-calorie sauces, both freshly prepared and stored, obtained according to the developed recipes, have high organoleptic and physicochemical parameters.



Effect of the storage time on the emulsion stoichiometry of samples of emulsion products

**Conclusion.** Based on the studies of the factors of formation of consumer properties of emulsion products, recipes and technology for obtaining low-calorie emulsion sauces have been developed.

The expediency and effectiveness of the use of deodorized refined vegetable oils of JSC "Shymkentmai" is substantiated.

It has been established that emulsion product of fat content of 35% on the basis of sunflower oil produced by JSC "Shymkentmai" with a plant additive is characterized by a higher value of the total quality index due to the delicate taste and absence of foreign flavors. The control sample of mayonnaise is perceived more acidic, and notes of the original oil are felt in the taste.

It is revealed that the calorie content of the new emulsion product is significantly reduced by reducing the prescription amount of vegetable oil, while maintaining high organoleptic parameters. Low amounts of protein in the formulations of the new emulsion product should be considered as a positive moment, as emulsion product is a sauce that is served to the main dish, including meat, fish and poultry.

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#### **«ШЫМКЕНТМАЙ» АҚ ШЫҒАРАТЫН КҮНБАҒЫС МАЙЫН ПАЙДАЛАНЫП ЭМУЛЬСИЯЛЫҚ ТҰЗДЫҚ ТЕХНОЛОГИЯСЫН ӨНДЕУ**

**Аннотация.** Зерттеу нәтижелеріне сәйкес, майонез өнімдерінің нарығы қарқынды дамып келеді деген қорытындыға келуге болады, алайда бөлшек сауда желілерінде ұсынылған майонез тұздықтарының ассортименті нашар және біркелкі емес, өнімнің осы түріне физиологиялық белсенді ингредиенттердің болуына байланысты тұтынушылардың денсаулығын сақтауға бағытталған өнімдер жоқ. Тұтынушылардың талғамы мен уәждерін зерттеу қазіргі тұтынушы табиғи ингредиенттер мен диеталық қоспалардың артықшылықтарын жақсы білетіндігін, құрамы бойынша теңгерімді және пайдалы қоспалардан тұратын өнімге қызығушылық танытатынын және майонездің құнынан гөрі мұндай өнім үшін көбірек төлеуге дайын екендігін көрсетті.

Эмульсиялық өнімдердің тұтынушылық қасиеттерін қалыптастыру факторлары бойынша жүргізілген зерттеу негізінде төмен калориялы эмульсиялық тұздық рецептісі және технологиясы өңделді.

«Шымкентмай» АҚның дезодоризацияланған тазартылған өсімдік майларын қолданудың орындылығы мен тиімділігі негізделген.

Сыртқы түрі, консистенция, иіс және дәм тәрізді органолептикалық көрсеткіштері бойынша тәжірибелі үлгіге бағалау жүргізілді. Шымкентмай» АҚ шығаратын күнбағыс майы негізінде өсімдік текті қоспалар (жиде ұнтағы мен бидай өскіні) қосылған майлылығы 35% болатын эмульсиялық тұздық бөгде дәмнің болмауы және нәзік дәмнің арқасында сапаның жиынтық көрсеткішінің жоғары мәнімен сипатталатындығы белгіленді. Органолептикалық көрсеткіштердің ұзақ сақталуы кезінде күнбағыс майының рецептурадағы мөлшерінің азаюының арқасында эмульсиялық тұздықтың калориясы едәуір азаятындығы айқындалды.

Жаңа эмульсиялық тұздық рецептурасындағы ақуыз мөлшерінің төмен болуы эмульсиялық тұздықты негізгі ас - ет, балық пен құс мәзірінде қолданылатын салмақты кез деп есептеуге болады.

Динамиканы талдай отырып, жиде ұнтағы мен бидай өскіні ұны қосылған эмульсия өнімі сақтауға анағұрлым төзімді деген қорытынды жасауға болады. Нормаларға сәйкес, эмульсияның тұрақтылығы кем дегенде 97%, 10 ° С температурада майонездегі майдың массасы 35%. Осылайша, майонез тұздығының жарамдылық мерзімі - 45 күнге дейін. 45 күн ішінде майонез тұздығының органолептикалық сипаттамалары шамалы өзгереді, бұл олардың жоғары көрсеткіштерімен расталады.

Жиде ұнтақтардың химиялық құрамы зерттелген. Жиде ұнтағы құрамында жеткілікті мөлшерде суда және майда еритін витаминдер, сонымен қатар минералды элементтер бар.

Тазартылған «Донья» күнбағыс майы негізінде майонез соусын жиде ұнтағы мен бидай өскіні ұнды қолдану жағдайында мыналарға мүмкіндік береді:

- Оңтүстік Қазақстанда май және май өнімдеріне сұранысты арттыру;
- отандық шикізат негізінде пайдалы тамақтану үшін майонез тұздықтарының түрлерін кеңейту;
- бидай өскіні ұнын эмульгатор ретінде, ал жиде ұнтағын тәттілендіргіш және функционалды ингредиент ретінде пайдалану арқылы функционалды, төмен калориялы жаппай тұтыну өнімін алу.
- халықтың тамақтануындағы дәрумендер мен минералдардағы тапшылықты азайту;
- осы өнімдердің тұтынушылық сипаттамаларының жақсаруына байланысты майонез соусына сұранысты арттыру.

**Түйін сөздер:** эмульсиялық өнім, функциялық, күнбағыс майы, тұтынушылық құндылығы.

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### **ИСПОЛЬЗОВАНИЕ ПОДСОЛНЕЧНОГО МАСЛА, ВЫПУСКАЕМОЙ АО «ШЫМКЕНТМАЙ» ПРИ РАЗРАБОТКЕ ТЕХНОЛОГИИ ЭМУЛЬСИОННОГО ПРОДУКТА**

**Аннотация.** По результатам проведенного исследования можно сделать вывод о том, рынок майонезной продукции быстро развивается, однако ассортимент майонезных соусов, представленный в торговых сетях, беден и однообразен, отсутствуют продукты, направленные на поддержание здоровья покупателей за счет наличия в составе данного вида продуктов физиологически активных ингредиентов. Изучение потребительских предпочтений и мотиваций выявило, что современный потребитель хорошо осведомлен о пользе натуральных ингредиентов и биологически активных добавок, и заинтересован в продукте, сбалансированном по составу и содержащем полезные для здоровья добавки, при этом готов платить за такой продукт больше, чем стоимость майонезов, представленных в розничной сети.

На основании проведенных исследований по факторам формирования потребительских свойств эмульсионных продуктов разработаны рецептуры и технология низкокалорийных эмульсионных соусов.

Обоснована целесообразность и эффективность применения дезодорированных рафинированных растительных масел АО «Шымкентмай».

Проведена органолептическая оценка опытных образцов продукта по следующим показателям: внешний вид, консистенция, запах и вкус. Установлено что, эмульсионный продукт жирности 35% на основе подсолнечного масла, выпускаемой АО «Шымкентмай», с растительной добавкой (порошок джида и мука из зародышей пшеницы) характеризуется более высоким значением совокупного показателя качества за счет нежного вкуса и отсутствия посторонних привкусов.

Выявлено, что калорийность данного эмульсионного продукта существенно снижена за счет уменьшения рецептурного количества растительного масла, при сохранении высоких органолептических показателей. Низкое количество белка в рецептурах нового эмульсионного продукта следует рассматривать как положительный момент, поскольку эмульсионный продукт – это соус, который подается к основному блюду, в том числе из мяса, рыбы и птицы.

Анализируя динамику, можно сделать вывод, что эмульсионный продукт с порошком джида и пшеничной зародышевой мукой более устойчив к хранению. Основываясь на том, что в соответствии с нормами стойкость эмульсии не менее 97%, продолжительность хранения майонеза с массовой долей жира 35% при температуре 10°С. Таким образом, срок годности майонезного соуса – до 45 суток. В течение 45 суток хранения незначительно изменяют свои органолептические показатели, что подтверждает их высокая балльная оценка.

Изучены химический состав порошка джида. Порошок джида в достаточном количестве в своем составе содержат водо- и жирорастворимые витамины, а также минеральные элементы.

Использование майонезного соуса на основе рафинированного подсолнечного масла «Доня» с добавлением порошка джида и муки зародышей пшеницы позволит:

- повысить спрос на масложировую продукцию ЮКО;
- расширить ассортимент майонезных соусов для здорового питания на основе отечественного сырья;
- получить функционального-низкокалорийного продукта массового потребления за счет применение муки зародышей пшеницы в качестве эмульгатора, а порошка джида в качестве сахарозаменителя и функционального ингредиента.
- уменьшить дефицит в питании населения в витаминах и минеральных веществ;
- повысить спрос на майонезного соуса в связи с улучшенными потребительскими характеристиками указанных продуктов.

**Ключевые слова:** эмульсионный продукт, функциональность, подсолнечное масло, потребительская ценность.

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