However, when risk analysis is implemented directly at the bank, you should perform a more detail information system description and estimate assets at all levels: financial, nonfinancial, economic, information. It is also necessary to take into account human resources, services that provide work of organization, (electricity, telephone, etc.). And according to the identified risk choose the means and measures to protect the system.

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ТЕХНОЛОГИЧЕСКИЕ АСПЕКТЫ ВИТАМИНИЗИРОВАНЫХ КУПАЖЕЙ РОСТИТЕЛЬНЫХ МАСЕЛ

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TECHNOLOGICAL ASPECTS OF FORTIFICATION OF BLENDED VEGETABLE OILS
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The abstract. The advantages of using vegetable oil to replenish PUFA fat-soluble vitamins before medications consist in that the vegetable oil is a traditional food product and does not create any complications and adverse reactions in the body and is much cheaper than drugs. The latter factor is important for the poor. Depending on the characteristics of blended oils, vitamin E and β-Keratin were used as enriching ingredients that are physiologically important components to the human body, as well as active TCP are natural antioxidants. It is proved that the simultaneous use of vitamin E and beta-keratin helps to stabilize the oxidation process and increase the induction period in 1,5-2,0 times, because each of these components not only exhibits particularly antioxidants, but synergistic features relative to each other too.

Keywords: mixtures, vitamins, tocopherol, beta-keratin, anti-oxidants, the induction period.

The introduction. Creating a balanced formulation of meat products with enhanced nutritional value and improved fatty acid composition and fortified with fat-soluble vitamins can be considered as important trends of modern diet, contributing to the development of a number of related industries meat processing industry. Modern food production moved to a new stage of development, when food program should solve the problem not only by meeting the needs of the population in some foods, but also by ensuring their balance on the basic nutrients [1].

Materials and methods. Vegetable oils are an important part of human diet. The chemical composition of vegetable oils as an objects modeled by nature is unique. But it is the science of nutrition that puts forward the slogan: "Due to health food," and corrects a modern approach to the assessment of the fatty acid composition of vegetable oils. Consequently, it is necessary to simulate the chemical composition of vegetable oils by technological means. Published data (Table 1, 2) [2, 3, 4, 5] show a large difference in the content and ratio of major groups of essential acids ω-6 and ω-3 (linoleic and α-linolenic acid) in vegetable oils. Consumption of vegetable oils in Ukraine is divided as follows sunflower oil (95,0-96,5 %); corn oil (8-10 %); soybean and olive oil (17 %); rapeseed oil (5-6 %) and consumption of refined oil is 46 %, crude is 14 %. The remaining 40 % of consumers are indifferent to the type of oil.

It should be noted that some populations consuming any of these oils due to regional traditions, or otherwise. However, consumption is usually spontaneous without the consideration of the fatty acid composition of oils and fat content in foods, biologically active substances.

Our greatest problem is that we eat too much fat containing fatty acid family of ω-6 (sunflower, corn, olive oil) and almost excluded from our diet products that are rich with fatty acids, ω-3 family (linseed and rapeseed oil). It is necessary to achieve a certain combination of ω-6 and ω-3 to maintain our health at the appropriate level.

Fatty foods with a specified balanced composition of fatty acids can be obtained in several ways. By transesterification method of picking up the required composition of fatty acid components or by method of blending vegetable oils with specific fatty acid composition. The second way is more efficient and cheaper, and requires the development of technology for mixtures of vegetable oils with improved fatty acid composition of high physiological value.

Regulatory and consumer requirements that apply to mixtures of vegetable oils, dictate the need for research and the creation the methods of calculation for balanced fatty acid composition systems.

This technique allows to obtain both and multicomponent systems of vegetable oils and enrich their fat-soluble vitamins, phospholipids and other biologically active components and use them for food and for their fat-based products.

Problem formulation and its relation to the most important scientific and practical tasks. The subject of our research is the technology of fortification of blended vegetable oils. Set blends vegetable oils were chosen as an object of research, i.e. sunflower oil (89 %) + linseed oil (11 %), sunflower oil (86 %) + Camilla oil (14 %), pumpkin oil (90 %) + Linen (10 %), pumpkin oil (85 %) + Camilla oil (15 %), sunflower oil (77.5 %) + Camilla oil (13 %) + linseed oil (9.5 %), pumpkin oil (77 %) + Camilla oil (13 %) + flaxseed oil (10 %). For determining quality vitaminous blends standard methods were used. Peroxide number was determined by the number of ISO 3960:2001 [6], Iodine number was determined by the number of ISO 3961:2004 [7] and the acid number was determined by the number of ISO 4536:2006 [6]. All samples of oil were produced in the Odessa plant stone fruit and vegetable oils by cold pressing during the period from August to October 2013.

Our aim is to study and investigate the properties of vitaminous blended vegetable oils experimentally.

Analysis of available scientific, technical and patent information showed that the improvement of physical, chemical and technological criteria for getting mixed crude and refined vegetable oils with improved or optimal composition of fatty acids is relevant [8].

Adding fat-soluble oils in the formulation of blended oils increases their efficiency when incorporated into food diet of people with cardiovascular disease and other diseases associated with excessive gain free-radical oxidation of lipids in the body.

Thus, the fortification of foods with vitamins and polyunsaturated fatty acids can be considered as an important trend in diet matters and creating balanced recipes food with higher nutritional value.

It is important that the stability of vitamin A in oils is higher than in any other food and also oils contribute to the absorption of vitamin A in the body. Scientific Research Institute of Nutrition experts recommend to enrich foods so that one portion will contain at least 30% of RCR (recommended consumption rates) [9, 10, 11, 12].

Diets containing mixed oils contribute to use them, mainly, to create a structural lipids do not become replacement lipids and thereby allow for the prophylaxis and treatment of many diseases. There are known fat blends for diet with Linoleic acid content of at least 40% in which the ratio between saturated and unsaturated fatty acids is close to 1:2.

The enrichment of sunflower oil with glycerides of linolenic acid content in its rational mixture (1,0-1,5%) promotes the synthesis of arachidonic acid in the body. The addition of vitamin A to the mixture further increases the synthesis of arachidonic acid, and the addition of vitamin E also cover its increased demand at a content in the mixture mentioned amounts of linolenic acid [1].

Thus, the fortification of foods with vitamins and polyunsaturated fatty acids can be considered as an important trend in diet matters and creating balanced recipes food with higher nutritional value.

Technological aspects of fortification of blended vegetable oils. Creating a blended oil enriched with biologically active components, has become an important purpose of our research. Taking into account the principles for food fortification, the choice of biologically active substances has been carried, a rational number and the technological aspects of incorporation was determined.

Blended oil is a system in which groups of PUFAs ω-6 and ω-3 are present in the necessary proportions. It is prone to oxidation processes at the most due to the increased content of polyunsaturated fatty acids. Depending on the characteristics of blended oils, vitamin E and β-Keratin were used as enriching ingredients that are physiologically important components to the human body, as well as active TCP are natural antioxidants.

The content of β-carotene in the original vegetable oils generally does not exceed 0.007%, the average content of vitamin E is presented in Table. 1 [10, 13, 14, 15].

Table 1

Content of vitamin E in vegetable oils

Vegetable oil	Tocopherols mg/100g
Sunflower oil	40-70
Pumpkin Seed oil	50-60
Linseed oil	48-50
Camellia oil	50-100

As seen from Table 1, the content of vitamin E in vegetable oils varies considerably. Presence of vitamin E in these oils provides a certain base oils and their resistance to oxidation processes.

There remains the addition of vitamin E in the blended system, which in has no significant oil content of tocopherols in its composition.

According to the FAO, WHOS, the daily requirement for vitamin E and β-carotene is respectively 15 mg and 5 mg. Therefore we have chosen the following scheme of fortification of blended oils: 30% of the daily requirement of vitamin E and 30% of the daily requirement of β-carotene. This amount of vitamins should be contained in 20 g blended oil (20 g corresponds to a daily rate of consumption of vegetable oil).

Pre investigated the solubility of oil suspensions of natural β-carotene preparation following concentrations: 0.2 %; 0.4 %; 0.6 %; 0.8 % of 30 % oil suspension preparation synthetic β-carotene and vitamin E oil suspensions: 1,0 %, 5,0 % and 10 %. Concentrations oily suspensions β-carotene and vitamin E are shown in Table. 2-3.

Table 2

The concentration of oil suspensions of β-keratin

The concentration of oil suspensions of β-keratin, %	Quantity of oily suspension of β-keratin, g per 100g of blended oil
0,2	3,750
0,4	1,875
0,6	1,250
0,8	0,937
30	0,025

Table 3

The concentration of oil suspensions of vitamin E

The concentration of oil suspensions of vitamin E, %	Quantity of oily suspension of vitamin E, g per 100g of blended oil
1	2,5
5	0,5
10	0,25

In research it has been found that the solubility of oil suspensions (0,2 %, 0,4 %, 0,6 %, 0,8 %, 1,0 %, 5,0 %) is concentration independent β- carotene and vitamin E. All data preparations concentrations are readily soluble in oil.

There is uniform distribution of the suspension over the entire volume of oil. For further laboratory test samples were chosen oily suspension β-carotene at a concentration of 0,2% and vitamin E at a concentration of 1,0 %.

The solubility and uniform distribution of 30 % β-carotene and 10 % of vitamin E is complicated due to their high concentrations. This requires: a long time for mixing and a higher temperature.

Efficiency technologies fortification of blended oils with essential PUFA composition is determined by the uniformity of the distribution of vitamins in the system and its stability. Based on the above conditions, we have developed the following scheme fortification of blended oils (Figure1).

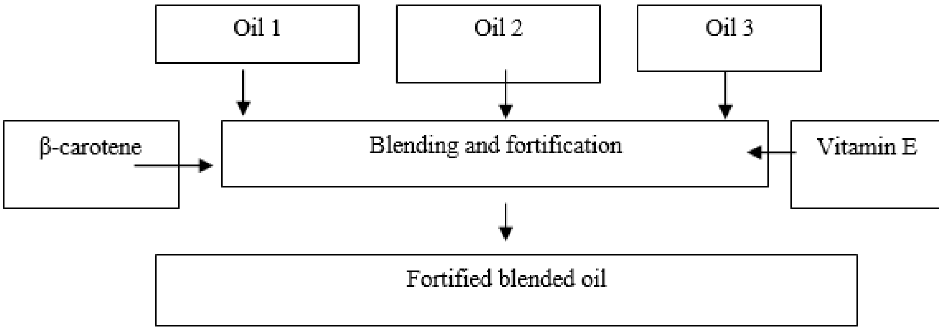

Figure 1. Scheme of blended oil fortification

Later interest was the study of blended oils on the oxidative stability during thermal oxidation. Because the blended oil is a concentrated source of PUFAs (linoleic and linolenic acids) capable of oxidation, the shelf life of these oils is an important factor.

We investigated the induction period of oxidation of blended oils without additives and blends containing antioxidants favorites.

Figure 2 shows the experimental results of determining the induction period, conducted with the use of the accelerated oxidation at 70-75 ° C. The completion of the induction period is taken when the model number on the level of peroxide number 2,5 mmol1 / 2O / kg.

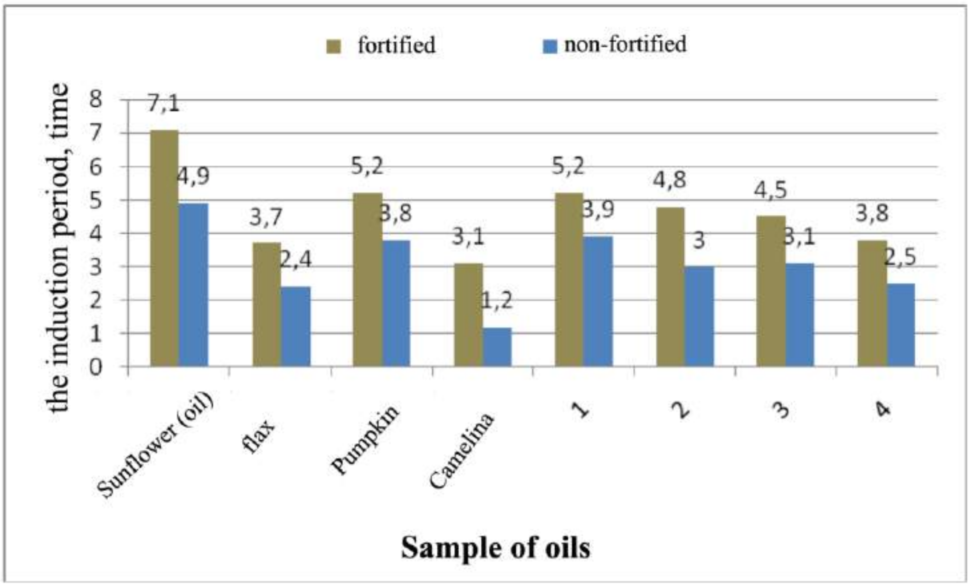

Figure 2 — The induction period of oxidation of blended oils ratio of ω-6: ω-3 is equal to 10:1

Blend 1 — sunflower oil (89 %) + flaxseed oil (11 %);
Blend 2 — sunflower oil (86 %) + camellia oil (14 %);
Blend 3 — pumpkin seed oil (90 %) + flaxseed oil (10 %);
Blend 4 — pumpkin seed oil (85 %) + camellia oil (15 %).

As the results of studies during the oxidation of blended oils less than the oxidation of sunflower and pumpkin oil, but slightly higher than the flax and camellia. However, by adding both the oils and blended oils to antioxidant (fortification) allows to increase the induction period of 1,5-2,0.

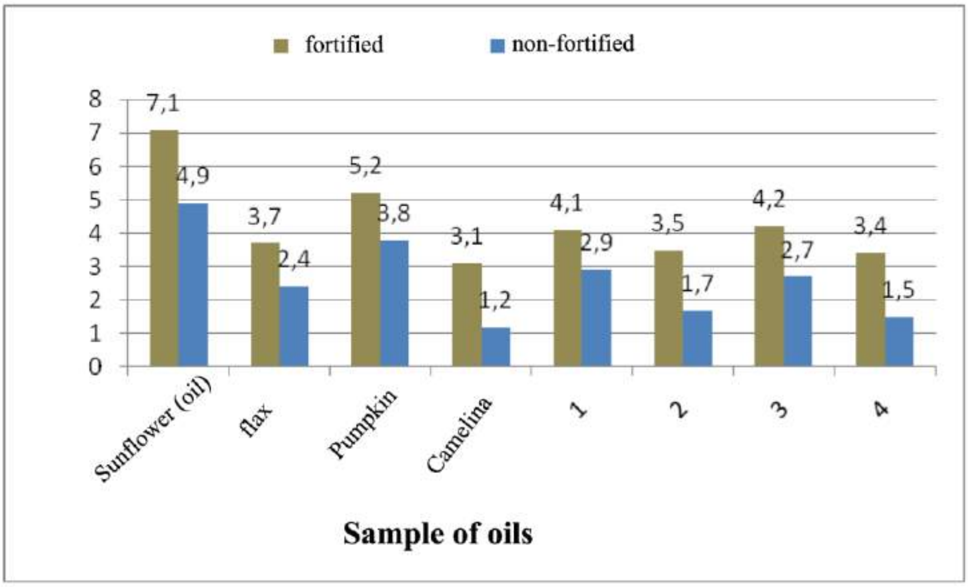

Figure.3 — The induction period of oxidation of blended oils ratio of ω-6: ω-3 is equal to 5: 1:

Blend 1 — sunflower oil (79 %) + flaxseed oil (21 %);
Blend 2 — sunflower oil (73 %) + camellia oil (27 %);
Blend 3 — pumpkin seed oil (80 %) + flaxseed oil (20 %);
Blend 4 — pumpkin seed oil (72 %) + camellia oil (28 %).

From Figure 3 it is clear that the induction period of blended oils with high acid content of ω-3 family acid (ratio of ω -6:ω-3 is equal 5:1) is less than blended oils in which the ratio of ω-6:ω-3 is equal 10:1. However, as with previous results, the addition of antioxidants to individual oils and blended oils (fortification) can increase the induction time in 1,5-2,0 times.

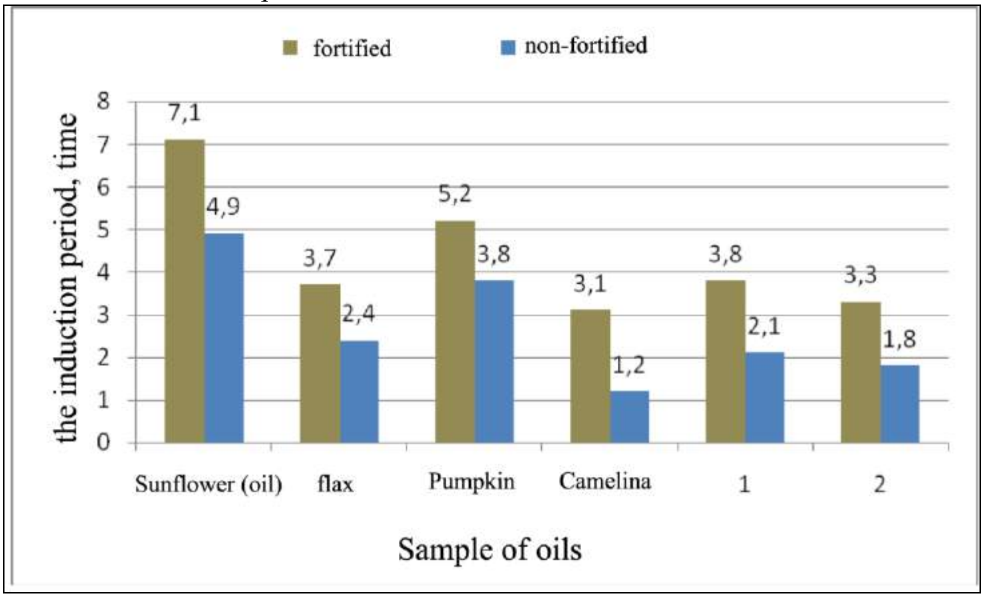

Figure.4 — The induction period of oxidation of blended oils ratio of ω-6: ω-3 is equal to 5: 1:

Blend 1 — sunflower oil (77.5%) + camellia oil (13%) + linseed oil (9.5%);
Blend 2 — pumpkin seed oil (77%) + camellia oil (13%) + linseed oil (10%).

The results shown in Figure 4, confirm the effectiveness of antioxidants and prove the feasibility of their introduction into the blended oil systems for the purpose of fortification as well as to prevent oxidation processes. Joint use of vitamin E and β-carotene to stabilize the oxidation process, since each of these components exhibits not only the properties of antioxidants, but also synergistic properties with respect to each other.

Implementation of the proposed technological solution production of blended vegetable oils can be carried out on plants of various capacities, using different instrumental lines and requires no additional material costs.

Table 4
Fatty acid composition of two-component blended oils (ratio of ω-6: ω-3 is equal to 10:1)

PUFAs composition, ratio %	Samples of blended oils			
	Sunflower oil (79%) + Linseed oil (21%)	Sunflower oil (73%) + Camilla oil (27%)	Pumpkin seed oil (80%) + Linseed oil (20%)	Pumpkin seed oil (72%) + Camilla oil (28%)
Lino-leic acid 18:2	57,61	56,79	54,29	52,82
Alpha-Linol-enic acid 18:3	6,19	4,99	5,68	5,37
Omega-6/Om-ega-3	9,3:1	10,4:1	9,6:1	9,8:1

Table 5
Fatty acid composition of two-component blended oils (ratio of ω-6: ω-3 is equal to 5:1)

PUFAs composition, ratio %	Samples of blended oils			
	Sunfl-ower oil (89 %) + Linseed oil (11 %)	Sunfl-ower oil (86 %) + Cam-illa oil (14 %)	Pum-pkin seed oil (90 %) + Lins-eed oil (10 %)	Pum-pkin seed oil (85 %) + Camilla oil (15 %)
Linoleic acid 18:2	53,08	51,41	50,18	47,98
Alpha-Linoleic acid 18:3	11,74	9,53	11,22	9,91
Ome-ga-6/Om-ega-3	4,5:1	5,4:1	4,5:1	4,84:1

Table 6
Fatty acid composition of three-component blended oil (ratio ω-6:ω-3 is equal to 5:1)

PUFAs composition, ratio %	Samples of blended oils	
	Sunflower oil (77,5%) + Camilla oil (13%) + Linseed oil (9,5%)	Pumpkin seed oil (77%) + Camilla oil (13%) + Linseed oil (10%)
Linoleic acid 18:2	52,90	49,45
Alpha-Linoleic acid 18:3	9,91	10,21
Omega-6/Omega-3	5,3:1	4,8:1

Conclusion

Two-component and three-component blends rich with tocopherol β-carotene were developed and determined their level of fortification: tocopherol – 30 % of daily needs and β-carotene – 30 % of daily needs. The feasibility of sharing tocopherol and β-carotene was confirmed and so it helps to stabilize the oxidation process and increase the induction period in 1,5-2,0 times.

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ПРИМЕНЕНИЕ НЕЧЕТКИХ МНОЖЕСТВ ДЛЯ ИНФОРМАЦИОННОЙ ПОДДЕРЖКИ ФУНКЦИОНИРОВАНИЯ ИЗНОШЕННОГО ЭЛЕКТРООБОРУДОВАНИЯ

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APPLICATION OF FUZZY SETS FOR INFORMATION SUPPORT OF FUNCTIONING OF WORN-OUT ELECTRICAL EQUIPMENT

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Summary: Theoretical aspects of application of mathematical apparatus of fuzzy sets and linguistic variables for the formalization of modes of governance in electrical equipment with worn-out equipment.

Key words: worn-out electrical equipment, fuzzy set, fuzzy number, fuzzy set theory, linguistic variable.

Аннотация: Рассмотрены теоретические аспекты применения математического аппарата нечетких множеств и лингвистических переменных для формализации режимов управления в электрохозяйствах с изношенным оборудованием.

Ключевые слова: изношенное электрооборудование, нечеткое множество, нечеткое число, теория нечетких множеств, лингвистическая переменная.