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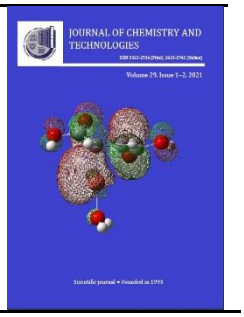

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INVESTIGATION OF FAT ACIDIC COMPOSITION AND PHYSICO-MECHANICAL INDEXES OF DRY MILK POLYCOMPONENT MIXTURES

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Abstract

Dry milk products are in growing demand and popularity. In this scientific work we have investigated the influence of sunflower oil on fattyacidic composition of fat phase and physico-mechanical qualities of dry polycomponent mixtures. The fattyacidic composition was determined by capillary gas-liquid chromatography, physical and mechanical parameters were determined by standardized methods. It was found that the use of sunflower oil has a positive effect on fattyacidic composition, organoleptical and physico-mechanical indexes of mixtures. It was determined that the addition of 2.5 % sunflower oil to the dry mixtures it increases the mass fraction (part) of fat in them by 57 %, decreases the hygroscopicity by 7.1 %, increases the specific gravity by 41.7 % in comparison with the control sample without vegetable oil. It was stated that the dose of vegetable oil doesn't influence on the indexes of solubility and active acidity of the product. It was defined he introduction of vegetable oil in an amount of 1.5 % and 2.5 % considerably changes the balance of fatty acids improving the nutritional value of product, as evidenced by the correlation of SFA (saturated fatty acids): MUFA (monounsaturated fatty acids): PUFA (polyunsaturated fatty acids) proves it. It was stated that the sunflower oil content close to 1.5 % allows the highest coefficient characterizing the biological action of fats in the product.

Keywords: dry mixtures, sunflower oil, fattyacidic composition, correlation of fatty acids, physico-mechanical indexes.

ДОСЛІДЖЕННЯ ЖИРНОКИСЛОТНОГО СКЛАДУ ТА ФІЗИКО-МЕХАНІЧНИХ ПОКАЗНИКІВ СУХИХ МОЛОЧНИХ БАГАТОКОМПОНЕНТНИХ СУМІШЕЙ

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Анотація

Мета. Провести дослідження жирнокислотного складу та фізико-механічних показників сухих багатокомпонентних сумішей на основі молочних складових. Методи. Визначення жирнокислотного складу проводили методом капілярної газорідинної хроматографії, фізико-механічні показники визначали за стандартизованими методами. Результати. Встановлено, що використання соняшникової олії позитивно впливає на жирнокислотний склад, органолептичні та фізико-механічні показники сухих сумішей. Визначено, що внесення в сухі суміші соняшникової олії 2.5 % призводить до збільшення в них масової частки жиру на 57 %, зменшення гігроскопічності на 7.1 %, зростання насипної щільності на 41.7 % у порівнянні з контрольним зразком без рослинної олії. Відзначено, що доза рослинної олії не впливає на показники розчинності та активної кислотності продукту. Висновки. Встановлено, що внесення рослинної олії у кількості 1.5 % та 2.5 % помітно змінює баланс жирних кислот у сторону поліпшення харчової цінності продукту, про що свідчить співвідношення НЖК (ненасичених) : МНЖК (мононенасичених) : ПНЖК (поліненасичених) жирних кислот. Доза внесення соняшникової олії 1.5 % дозволяє отримати найбільш високий коефіцієнт, який характеризує біологічну ефективність жирів продукту.

Ключові слова: сухі суміші, соняшникова олія, жирнокислотний склад, співвідношення жирних кислот, фізико-механічні показники.

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ИССЛЕДОВАНИЕ ЖИРНОКИСЛОТНОГО СОСТАВА И ФИЗИКО-МЕХАНИЧЕСКИХ ПОКАЗАТЕЛЕЙ СУХИХ МОЛОЧНИХ МНОГОКОМПОНЕНТНЫХ СМЕСЕЙ

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Аннотация

Цель. Провести исследования жирнокислотного состава и физико-механических показателей сухих многокомпонентных смесей на основе молочных составляющих. Методы. Определение жирнокислотного состава проводили методом капиллярной газожидкостной хроматографии, физико-механические показатели определяли стандартизированными методами. Результаты. Установлено, что использование подсолнечного масла положительно влияет на жирнокислотный состав, органолептические и физико-механические показатели сухих смесей. Определено, что внесение в сухие смеси подсолнечного масла (2.5 %) приводит к увеличению в них массовой доли жира на 57 %, уменьшения гигроскопичности на 7.1 %, возрастанию насыпной плотности на 41.7 % по сравнению с контрольным образцом без растительного масла. Отмечено, что доза растительного масла не влияет на показатели растворимости и активной кислотности продукта. Выводы. Установлено, что внесение растительного масла в количестве 1.5 % и 2.5 % заметно изменяют баланс жирных кислот в сторону улучшения пищевой ценности продукта, о чем свидетельствует соотношение НЖК (ненасыщенных) : МНЖК (мононенасыщенных) : ПНЖК (полиненасыщенных) жирных кислот. Доза внесения подсолнечного масла 1.5 % позволяет получить наиболее высокий коэффициент, характеризующий биологическую эффективность жиров продукта.

Ключевые слова: сухие смеси, подсолнечное масло, жирнокислотный состав, соотношение жирных кислот, физико-механические показатели.

Introduction

An important direction in modern food production is the development of products with a higher food and biological value by keeping their fatty acid composition in balance fats and oils are a necessary compound of a healthy nutrition, but the type of fat and the level of its consumption have great importance for normal functioning of a human body [1].

Taking into account the fact that dry milk mixtures on the basis of polycomponent systems contain important physiological ingredients and have functional-technological qualities, it is necessary to effectively regulate their fatty acid composition by adding liquid vegetable oils.

Milk fat is characterized with unique fatty acidic composition. According to the latest investigations, about 416 [14; 15] fatty acids were discovered in the glycerids of cow milk. However, fattyacidic composition of milk fat can't be considered as ideal since its total content of saturated acids is 54–71 %, unsaturated – 20–25 %, polyunsaturated (linoleic and linolenic) – only up to 5 % [16].

Food fats fulfill two functions in human's organism: non-soluble vitamins, material for biosynthesis and construction (building) of adipose tissues of organism. Such balanced diet is realized by including 1/3 of vegetable oils and 2/3 animal oils in the diet [2; 3].

Experts of the World Organization of Health Protection [WOHP] [4] consider that fatty food and correlation of saturated (SFA) monounsaturated (MUFA) and polyunsaturated (PUFA) fatty acids in the composition of fatty products must be equal as 1 : 1 : 1.

American Dietetic Association [5] recommends to limit consumption of fat to 35 % cal of daily ration, as consumption it too much as a rule leads to obesity. At the same time high level of fat consumption with great number of saturated fatty acids and cholesterine increases risk of so development some diseases. They may be: heart and vascular diseases, oncology, different endocrinological changes and so on. On the contrary, if we reduce fats in diet to less than 20 % of cal., it leads to shortage of fattysoluble vitamins, un replaceable fatty acids, and, as a result to declinations in physiological state of organism, disturbance of central nervens rertem activity decrease of immunity, shortening of duration of humans' life.

On the basis of the data of scientific – research institute of food technologies Russian Academy of Medical Sciences there were calculated correlation of fatty acid groups, which characterize balanced fad of higher biological effectiveness: 35–45 % PUFA, 30–35 % MUFA and 28–35 % SFA. Very important index may be ratio (PUFA: SFA) which must be in the limits of 0.3–0.4 [2; 8] in the diet of healthy person.

Besides, fat is a component of food stuffs and takes part in formation of main organoleptic properties [9; 10]. Namely, fat absorbs many aromatic combinations and in such a way it masks or softens strong smell of food stuffs in account of

decreasing the acidity of ingredients [11], has positive influence on consistence, good state, texture, increases feeling of satiety after taking food [12].

Quality of food stuffs, milk products namely, is closely connected with fatty acid composition of their fatty phase.

Milk fat is characterized with unique fatty-acid composition. As to the latest investigations glycerides of cow milk contain about 416 fatty acids [14; 15]. But fatty-acid composition of milk fat is not ideal as total composition of saturated acids in it is 54–71 %, unsaturated – 20–25 %, polyunsaturated (linoleic and linolenic) - only to 5 % [16].

Quality of food stuffs, especially milk products, is also very much connected with fatty acidic composition of their fatty phase. PUFA are very important in many biological processes of the human's organism. Many investigations prove positive influence PUFA on human's health, especially, heart and vascular oncological coronary artery disease, inflammatory processes, thrombotic and autoimmunial diseases, high blood pressure, diabetes of the second type, nephritis, rheumatic fever, colitis and others [17; 18].

High concentration of PUFA are present in liquid vegetable oils. Vegetable oils are sources of important fatty acids: MUFA and PUFA [19]. Investigations of the most important, sunflower oil as well, have shown that PUFA prevail in fatty acids compositions, their composition varies from 54.3 % to 79.1 % [19; 20]. Besides, as scientific data received from investigations of 14 vegetable oils (saflore, grape stones, cannabis, sunflower, wheat germ, pumpkin seeds, sesame, rise, almonds rape, ground nut, olive, coco-nut) show that the highest composition of PUFA, received from 1gr. of oil (786,8 % ERDI and 626.3 % ERDI) were in sunflower (SEL) and saflore (SAF) oil correlatively. Food aspect of investigated vegetable oils was estimated by definition of energetic contribution E (in % ERDI) of fatty acids (UFA, MUFA and PUFA) which was recommended for dietary use of usual fat (ERDI – 37.7 cDj/gr), and their quantity (gr) necessary for satisfaction 24-hour dose was calculated using the highest indexed of recommended 24-hour doses of fatty acids (ERDI) [19].

So, chemical composition of fats is very important for characteristic of food value of concrete product. Correlation of fatty acids is one of the indexes of biological effectiveness of fats [2].

Therefore, an important direction in up-to-date food production is working out products with higher food value thanks to their enrichment with naturel vegetable oils which can diversify assortment taking into account improvement balance of fattyacid composition.

Taking into account that dry milk products are more and more popular and are in gread demand in perspective is working out dry milk mixtures on the basis of polycomponent systems which contain important physiological ingredients and have functional-technological properties. Using vegetable oils is effective to regulate fatty acid composition and increasing food value of the product.

Such, scientists as: C. Semeniuc, M. A. Rotar, W. P Batiston, S. A Maruyama, B. I. Davis, A. Siddique, H. Habtegebriel, M. Wawire, M. V. Borges, M. F. Alves, I. A. Ivkova, A.S. Pilayeva and others investigated fattyacid composition, physico-chemical and physico-mechanical properties of dry products [21–27].

Is their article C. Semeniuc, M. A. Rotar and others were investigating fattyacid, composition in dry milk products, namely, in dry this whole milk with 26 % of fat and children mixture with sunflower oil. Investigations were made with chromatography method [21].

Batiston W. P., Maruyama S. A. and others were studying in their works fattyacid composition of dry whole cow and goat milk with gasliquid chromatography. With this purpose they determined composition of polyunsaturated fatly acids in ten samples of cow milk and two samples of goat milk and then they compared results in dry products [22].

Davis, B. I., Siddique and others investigated fatty acid composition and physicochemical properties of dry goat milk in dependence of temperature and term of preservation [23].

In their investigations H. Habtegebriel, M. Wawire studied influence of different temperature regimes of spray drying on fatty acid composition of camel milk with the purpose of classification dry products on high thermic and low termic. Scientists also determined influence of different temperatures of drying on physico-mechanical properties of dry camel and cow milk, namely on specific weight [24; 25].

M. V. Borges, M. F. Alves and other were investigating fatty acid compositiond, physico-chemical and physico-mechanical properties of dry buffalo milk received with spray-drying metod. Scientists analysed in the product presence of moisture, fat, protein, acidity, specific weight and index of solubility [26].

In their article I. A. Ivkova and A. S. Pilayeva studied fattyacid composition of dry milk product

of special application in which 50 % of milk fat was changed into vegetable oil [27].

But questions, investigated by them, don't give the answer in full. Further investigations must be devoted to studying influence of liquid vegetable oils, exactly, sunflower oil on fatty acidic composition and physico-mechanical qualities of dry manycomponent mixtures of higher food and biological value.

Materials and methods

Milk polycomponent mixtures, received by the method of spraying drying with sunflower oil 0.5 %, 1.5 % and 2.5 % were the subject of investigation. The control material was dry polycomponent mixture on the basis of milk component using barley malt extract as hydrocarbon and concentrate of whey proteins, but without vegetable oil content [28].

Definition of fatty acidic content was made by the method of capillary gasliquid chromatography [29; 30] on chromotograph "Dome-55", equipped with capillary column HP-88, the length of which is 100m.

Calculation of balanced criterion of fattyacidic composition (Uz) for estimation of balanced manycomponent products [31] was defined as geometrical mean according to the formula:

$$U_f = \sqrt[n]{\prod_{j=1}^{n} \frac{F_j}{F_{ej}}} \quad U_f = \sqrt[n]{\prod_{j=1}^{n} \frac{F_j}{F_{ej}}}, \qquad (1)$$

where F_j – mass part of j-volatile fatty acids (VFA) in product, %

F_{ei} – mass part of j-fat acid in relatively, to physiologically necessary norm, %

n – quantity of fatty acids in the product to be investigated.

Mass part of moisture in dry products was defined with standardized method (ДСТУ |SSU 8574:2015 Milk products. Methods of definition of mass part of moisture in dry milk and concentrated products and canned food which contain milk. [Actual from 2007-01-01]. Published Kyiv: SE "UkrSRNC", 2016, 12 p.), which is based on the-property of product to lose free moisture during drying at the constant temperature (102 ± 2)°C for the final result was taken arithmetical mean of the results of two parallel measurement of one sample, permissible divergences between them didn't exceed 0.06 %.

Mass part of fat was defined with standardized acidic method (ГОСТ | SS 29247-91 Canned milk. Methods of fat definition. Published Moscow: Standartinform, 2009, 7p.) based on educing fat from dry products under the action of concentrated pa acid and izoamil alcohol with further centrifuging and measuring volume of fat in graduated part of butyrometer. For the final result was taken arithmetical mean of the results of two parallel measurements of one sample when permissible divergences between them didn't exceed 0.05 %.

Active acidity of dry mixtures was determined with standardized potentiometric method (ДСТУ|SSU 8551:2015 Canned milk concentrated and dry milk products. Definition of acidity with potentiometer and titrometer methods. [Actual from 2007-01-01]. Editer officially Kyiv SE: "UkrSRNC", 2016. 12 p.), applying potentiometric analyzer. The result of measurement was calculated to the third tenth sign with rounding to the second tenth sing. For the final result of measurement of active acidity was taken arithmetical mean of two parallel measurements when results were similar: $|X_1 - X_2| \le 0.06$, where X_1, X_2 – mean two parallel measurements of active acidity in dry milk product, received in condition of *repetition* 0.06 – the limit of similarity.

Specific weight was defined with standardized method (ДСТУ|SSU 7644:2014 Dry milk products. Methods of definition of specific weight. [Actual from 2015-07-01]. Edited officially Kyiv SE "UkrSRNC", 2016, 6 p.) as correlation of mass poured without density product to its volume, expressed in gr/sm^3. Absolute difference between results of two parallel measurements, received at the condition of fulfillment their similarity mustn't exceed in more than 5 % cases – 0.025 gr/sm^3. The result of two parallel measurements of one sample was calculated to the second tenth sing.

Relative speed of solubility was defined with standardized method (ДСТУ|SSU 4556:2004 Instant milk. Technical conditions. [Actual from 2007-01-01]. Edited officially Kyiv: SSU, 2007, 14p.) which is based on the definition of dry substance quantity which passed into solution during mixturing of research sample during 5 sec at (20 ± 0.5)°C and defined in received filtrate of dry substances content using refractometer. For the final result was taken arithmetical mean of the results of two parallel measurements of one sample, permissible divergences between them didn't exceed ± 2 %.

Index of solubility was defined with standardized method (ГОСТ| SS 30305.4-95 Dry milk products. Methods of measurements of solubility indexes. Published officially Moscow. Standartinform, 2009, 4p.) which is based on the measurement of volume of unsalable sediment in renovated sample of dry product after being centrifuged with the speed of 1000 rev/min

during 5 min. For the final result was taken arithmetical mean of the results of two parallel measurements of one sample, which was calculated to the first tenth sign. Permissible divergences between the results didn't exceed 0.1 sm^3.

Statistical analysis. Mathematical calculation of the results was done with the method of statistical analyses and standard algorithms of Microsoft Excel program with threefold repetition of research. Results were taken as authentic at a = 0.95.

Result and their discussion

Dry milk products enriched with vegetable fatty components are in great demand today. It permits to increase food and biological value of the product, to increase its organoleptic indexes.

In order to increase biological value of the dry milk mixtures, they were enriched with unsaturated fatty acids of vegetable original, namely PUFA, adding into investigated samples 0.5 %, 1.5 % and 2.5 % refined sunflower oil. Sunflower refined oil which is deodorized is not high at cost price and is characterized with neutral taste which is harmonized with milk basis. Besides, as scientific investigations show [19] it has high content of PUFA.

On the basis of investigations of fatty acid composition of fatty phase of dry mixtures, it was calculated correlation of fatty acidic groups, which characterize balance of fatty acidic composition and is one of the indexes of biological effectiveness of fats. Data of experimental investigations are shown in table N1.

It was defined that the nearest to the standard of the correlation fatty acids groups [SFA, MUFA, PUFA] are in the samples N2 and N3 with the close of vegetable oil 1.5 % and 2.5 %. For all this the best balanced of fatty acidic composition is characterized sample N2 with the use of 1.5 % sunflower oil, as to the correlation PUFA: UFA, which characterizes biological effectiveness of fats is on the recommendation of the data of the scientific-research food Institute Russian Academy of Medical Sciences in the limits of norm – 0.3–0.4 [2; 8].

Table 1

Correlation of the main fatty acids of the product

Examples	Dose of vegetable oil, %	Content of the main fatty acids, %			Correlation, which characterize biological effectiveness of fats	
		SFA	MUFA	PUFA	SFA: MUFA: PUFA	PUFA: SFA
Ideal fat	-	33.33	33.33	33.33	1: 1: 1	0.3-0,4
Control	-	68.78	27.28	3.95	2.52:1.00:0,14	0.057
1	0.5	63.19	26.87	9.93	2.35:1.00:0,37	0.157
2	1.5	52.94	27,10	19.96	1.95:1.00:0,74	0.377
3	2.5	47.06	27.71	25.24	1.69:1.00:0,91	0.536

In order to estimate balance of fats on its fatty acidic composition it is recommended to use creation R_1 (p/u), which is own interpretation of the common criterion of alimentary adequateness, proposed by academicians M.M. Lipatov and A.B. Lisitsin.

Criterion characterizes composition of saturated, monounsaturated and polyunsaturated fatty acids and their content in fatty component of the substance and finished product in comparison with the given standard of fatty acidic composition of fats [32].

Calculated coefficients of fatty acidic balance (R_{l3} and R_{l5}) of the lipid composition of milk fat with sunflower oil [33] are shown in table2.

It was defined that for their content SFA, MUFA and PUFA sample N3 was the nearest to the standard, particularly for PUFA content. However, sample N1 differed with the highest coefficient of fatty acid balance of the product (R_1) proceeded from the calculation for 3 and 5 fatty acids relatively. As to the content of linolic acid ($C_{18:2}$), sample N2 fixed the nearest to the standard index in comparison with other samples.

It was also noticed, that investigated samples don't have arachidonic acid ($C_{20:4}$), but if the product has enough quantity of linolic acid probability of its synthesis in the organism increases. It is known that gammalinolenic acid is formed in the organism from linoleic acid in the way of desaturation [2].

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Table 2

Characteristics of fatty acid balance of product

Examples	Characteristics of fatty acid balance of product								
	Fatty acids						Coefficient of fatty acid balance R_{Li}, (p.u)		
	SFA	MUFA	PUFA	linoleic ($C_{18:2}$)	lino-lenic ($C_{18:3}$)	Arachi-donic ($C_{20:4}$)			
	Composition, gr/100 gr of fatty acids						i=1..3	i=1..5	i=1..6
quazistandart	42.00	33.00	25.00	15.60	2.200	7.20	1	1	1
control	68.78	27.28	3.95	3.714	0.231	_	0.428	0.329	_
1	63.19	26.87	9.93	9.725	0.208	_	0.596	0.508	_
2	52.94	27.10	19.96	19.728	0.181	_	0.504	0.388	_
3	47.06	27.71	25.24	25.074	0.156	_	0.488	0.352	_

Arachidonic acid is synthesized in the organism from gamma-linoleic acid in the way of increasing of the chain length and desaturation. Arachidonic acid is limited one between PUFA, and is the most important component of cell membranes and phospholipids and plays an important roll at inflammatory processes and imunial reactions.

Thus, on the basis of investigation of fatty acidic composition of dry mixtures it is possible to make a conclusion that addition of vegetable oil makes better correlation SFA: MNFA: PUFA fatty acids and balance of fatty acid composition in investigated samples of dry product in comparison with control and as a result is leads the increasing of food value of dry mixtures. Consumption of sunflower oil of 1.5 % amount permits to receive the highest coefficient which characterize biological effectiveness of fats in products.

It was investigated the influence of sunflower oil on physico-chemical and organoleptic indexes of dry milk mixtures (Table 3). The quality of dry milk products were defined for their solubility and speed of solution, which, probably, can increase at capillary-porous structure of milk mixtures.

Table 3

Organoleptic and physico-chemical indexes of dry milk mixtures with different dose of adding sunflower oil, %

Name of index	Control	Dose of addition sunflower oil, %		
		0,5	1,5	2,5
		Example 1	Example 2	Example 3
Mass part of dry substances, %	95.40 ± 0.05	95.50 ± 0.03	96.42 ± 0.03	96.25 ± 0.06
Mass part of fat, %	14.0 ± 0.5	16.5 ± 0.5	17.0 ± 0.5	22.0 ± 0.5
Active acidity, pH	6.67 ± 0.02	6.65 ± 0.01	6.65 ± 0.01	6.64 ± 0.01
Index of solubility, sm^3 of cottage cheese sediment	0.1	0.1	0.1	0.1
Relative speed of solubility, %	49.33 ± 0.06	48.92 ± 0.08	49.70 ± 0.05	49.73 ± 0.07
Organoleptic indexes				
Outward appearance and consistence	fine dispersion powder with dense lumps	fine dispersion powder with some lumps	fine dispersion powder without lumps	
Taste and smell	Milky malt, without other smacks and smells	Milky, with small sweet smack without other smells	Milky with good sweet smack without other smells	
Colour	Creamy	Bright creamy	Bright-yellow with creamy shade	

It was defined that adding of sunflower oil doesn't influence on solubility and indexes of active acidity of finished products, which are on the level correlatively 0.1 sm^3 of cottage cheese sediment and 6.64–6.67 unit pH. But when we increase the dose of sunflower oil to 2.5 % in milk mixtures mass part of fat increased in 57 % in comparison with control sample (Table 3).

On the basis of organoleptic evaluation, it was defined that adding sunflower oil leads to making better taste qualities and consistence of final products. It was found that with the increasing of sunflower oil close smack of barley-malt extract which is in the recipe of dry product is leveled and lumps are absent (Table 3).

Physico-mechanical indexes of dry mixtures, their hygroscopicity and specific weight are important characteristics of quality of polycomponent mixtures, index of economic advantage and their ability to be served.

As received data show, the increasing of the sunflower dose to 2/5 % led to decreasing hygroscopicity in milk to mixtures on 7.1 % in comparison with the control (Fig.1).

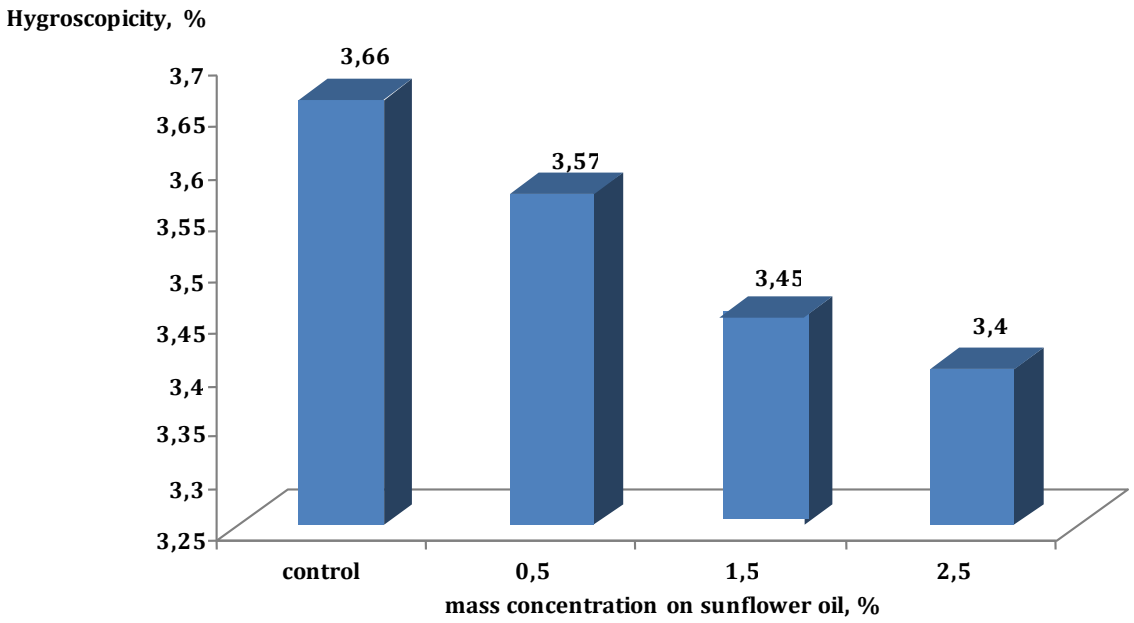

Fig. 1. Dependence of dry mixtures hygroscopicity on dose of sunflower oil, %

Investigations of the dependence of indexes of specific weight of dry mixtures on content of sunflower oil is shown on fig. 2. The results of experimental researches have shown that bringing in 2.5 % sunflower oil in milk-hydrocarbon base led to increasing indexes of specific weight on 41.7 % in comparison with control, which is more economically production of dry products advantageous during. Probably, thanks to bringing in liquid fat phase in milk mixture absorption balls are formed, liquid phase piles between clearances, is kept on them with the forces of surface tension and leads to increasing of specific weight. Making conclusion of above-stated, we can confirm the necessity of adding vegetable oil with the purpose of enriching PUFA, making better organoleptic and physico-mechanical properties and, as a result, increasing food value of the product.

It was stated, that use of sunflower oil positively influences on fatty acid~~ic~~ composition and physico-mechanical properties of dry mixtures. It was defined that bringing in sunflower oil of 2.5 % into dry mixtures increases content of fat in them on 57 %, decreases indexes of hygroscopicity on 7.1 %, leads to increasing of specific weight on 41.7 % in comparison with control sample without vegetable oil. It was stated, that dose of vegetable oil doesn't influence on the indexes of solubility and active acidity of the product.

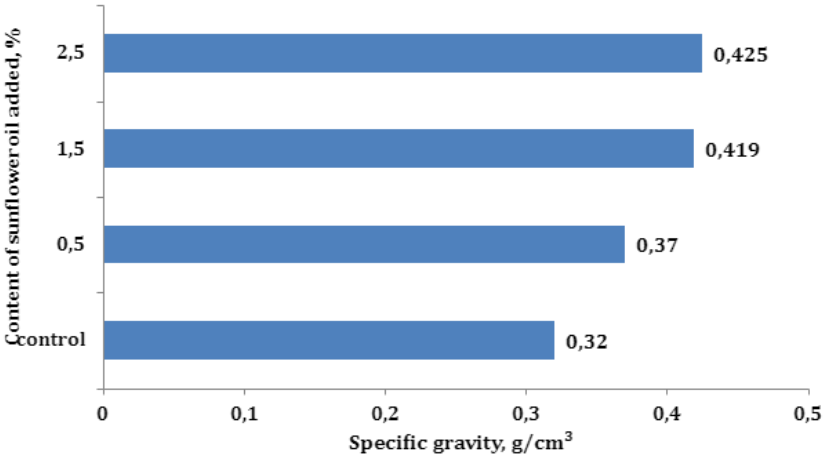

Fig. 2. Indexes of specific weight of dry mixtures with different dose of bringing in sunflower oil, %

Conclusion

It was stated, that bringing in vegetable oil of 1.5 % and 2.5 % increases food value of the product, correlation UFA (unsaturated) : MUFA (monounsaturated) : PUFA (polyunsaturated) fatty acids testify it. Bringing in sunflower oil of 1.5 % permits to receive the highest coefficient, which characterizes biological effectiveness fatsof the product, and to use in future indicated dose of vegetable oil in recipes of polycomponent mixtures.

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