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## THE USE OF LECITHIN OF ORGANIC ORIGIN IN THE TECHNOLOGY OF BAKERY PRODUCTS

### Abstract

The production of bakery products of organic origin has limitations in the use of various ingredients, first of all, 95% of the recipe composition should be of organic production. Organic low-fat sunflower lecithin LECICO SUN P 400 from the German company Lecico has appeared on the market of organic products, which makes it possible to expand the possibilities of improving the quality of bakery products labelled as organic. The purpose of the research is to develop a recipe for an organic loaf with an extended shelf life by using organic low-fat sunflower lecithin LECICO SUN P 400 from the German company Lecico and to study its effect on the consumer characteristics of an organic loaf with an extended shelf life. Based on trial laboratory baking and the calculation of a comprehensive quality indicator, a rational dosage of organic low-fat sunflower lecithin LECICO SUN P 400 in the amount of 0.6 % by weight of flour was established to improve the consumer properties of bakery products. Thus, in the case of adding 0.6 % by weight of flour, the specific volume increased by 9.1 % compared to the control due to an increase in the specific volume of the dough and a weakening of the gluten framework with the introduction of organic low-fat sunflower lecithin LECICO SUN P 400. It was found that the shape stability and porosity of the products are improved. It was found that the use of organic low-fat sunflower lecithin LECICO SUN P 400 prolongs the freshness of bakery products, namely, the degree of preservation of freshness of the products increases by 1.5 times, which is confirmed by a lower degree of crumbling and the formed sub-crust layer during 72 hours of storage. Taking into account the rational dosage of organic low-fat sunflower lecithin LECICO SUN P 400, a recipe for the organic loaf 'Soniachnyi' was developed using 100 kg of organic high-grade wheat flour, pressed bakery yeast - 3 kg, table salt - 1.3 kg, organic sugar - 2 kg, organic peasant sweet cream butter - 2.5 kg, organic low-fat sunflower lecithin LECICO SUN P 400 - 0.6 kg

**Key words:** organic lecithin, loaf, freshness, organic production, sub-crust layer

### Introduction

In recent years, food consumers have been paying more and more attention to their choices, opting for healthy, local and fresh food, with a growing interest in the sustainability of the food chain. In this regard, the production and consumption of organic food is growing globally and will continue to do so in the future to the extent that the global organic food market is forecast to grow [1].

Bakery products are among the products of daily consumption by all segments of the population. The daily consumption rate is 277 g per day. Providing the population with products with high consumer properties is the main task of bakery companies. One of the main indicators of the consumer properties of bakery products is the freshness of the products during their shelf life. Many studies have been devoted to the issue of extending the freshness of bakery products [2, 3].

One of the most effective ways to improve the consumer properties of bakery products is to use food additives that positively affect the quality of bread and slow down the staling process [4]. The use of surfactants can be considered one of the most effective methods to slow down the processes that occur with high-polymer crumb substances during storage [5].

In the organic market, the German company Lecico [6] offers organic low-fat sunflower lecithin LECICO SUN P 400, so it is advisable to investigate the use of organic low-fat sunflower lecithin LECICO SUN P 400 in the technology of organic bakery products to improve consumer characteristics.

### Literary review

In the bakery industry, surfactants are not used individually, but as a multicomponent mixture, namely as a phosphatide concentrate. According to the EU regulation, phosphatide concentrates are a mixture of phospholipid fractions obtained from animal or vegetable food substances by physical methods, in which the content of substances insoluble in acetone (namely phospholipids) is at least 56 % [7]. Phospholipids are considered safe food additives and can be used without restriction in food products consumed every day, namely in bakery products [8].

Lecithin is a phospholipid complex containing phosphatidylcholine (lecithin itself), phosphatidylethanolamine, phosphatidylinositol and other phospholipids [8]. By its ionicity, lecithin is an ampholytic surfactant, and its inclusion in the recipe composition of wheat flour bakery products significantly affects the quality of the finished product [9].



Phosphatide concentrates provide drying of the dough surface, which increases its elasticity and stability during machine processing. The interaction of lecithin with starch and the ability to bind water prolong the freshness of the crumb [10].

Scientists [11] investigated the possibility of using lecithins of Ukrainian producers' trademarks. It was found that their use improves the organoleptic and physicochemical quality of bakery products. It was found that when dosed with low-fat phosphatide concentrates in the amount of 0.9 % by weight of flour, bakery products retain freshness for 72 hours of storage without packaging. Unfortunately, these lecithins are not of organic origin.

The authors of [12] found that the addition of 0.6% sunflower lecithin resulted in a 25% increase in loaf volume. The study does not indicate whether this lecithin is of organic production.

The aim and objectives of the study: to investigate the use of organic low-fat sunflower lecithin LECICO SUN P 400 to intensify the technological process, improve the quality of organic wheat flour bakery products and prolong their freshness.

Materials and methods of research. The following types of raw materials were used in the study: high-grade wheat flour (TM 'Ecorod', Ukraine), baker's yeast (TM 'Lviv yeast', Ukraine), table salt (TM 'Artemsil'), organic low-fat sunflower lecithin LECICO SUN P 400 (Lecico, Germany), organic sugar (Brand: Ecorod) and organic sweet creamy peasant butter (TM Organic Milk).

The buns were made from high-grade flour (mass fraction of moisture - 13.1 %, gluten content - 24 %, IDC - 85 units. ) according to the recipe for road loaves made from high-grade wheat flour: high-grade wheat flour - 100 kg, pressed yeast - 1.5 kg (increased to 3.0, salt - 1.3 kg, sugar - 2.0, margarine replaced with peasant sweet cream butter - 2.5 kg according to the table of interchangeability) [13]. The dough was prepared using the no-bake method. Organic low-fat sunflower lecithin LECICO SUN P 400 was added during dough kneading in the amount of 0.2, 0.4, 0.6, and 0.8 % by weight of flour according to the recommendations of the manufacturer and scientists [5, 6].

To determine the quality of the bread, a scoring system was used and a complex indicator was calculated. The dough was kneaded in an Esher kneading machine for 4 min at the first speed and 7 min at the second speed. The dough was prepared using an accelerated method with a mass fraction of dough moisture of 43 %. The fermentation period was replaced by a proofing period of 30 min. The dough was handled manually, and the dough pieces were proofed in a proofing cabinet at a temperature of  $38 \pm 2$  °C and a relative humidity of  $78 \pm 2$  % until ready. The products were baked in a cabinet oven at 220...240 °C with humidification of the baking chamber.

The quality of bread was assessed by physicochemical (specific volume, shape stability, structural and mechanical properties of the crumb) and organoleptic parameters (appearance, crust surface condition, porosity structure, taste, smell). The duration of freshness preservation of the products was studied by changing the structural and mechanical properties of the crumb. Its total deformation was determined after 4, 24, and 48 h of stor-

age using an AP 4/1 penetrometer (Finemass (Germany)) [14, 15].

The degree of staleness of the products was also investigated by the crumb crust. The crumbliness was determined by the number of crumbs formed by friction of two pieces of bread crumb weighing 5 g, cut in the shape of a parallelepiped, during shaking for 5 min on a vibratory shaker IKA HS 501 digital (IKA®-Werke GmbH & Co. KG (Germany)). The crumbliness was expressed as the ratio of the crumb weight to the weight of the bread sample in percent [16].

The results of the experimental studies were subjected to mathematical and statistical processing, implemented using the MS Excel spreadsheet processor and the MathCAD mathematical application.

Results and discussion. In order to determine the technological effectiveness of the use of organic low-fat sunflower lecithin LECICO SUN P 400 (OLFLS) in the production of bakery products, studies were conducted to determine its effect on the technological process and quality of bakery products at different dosages.

During the study, bakery products were baked with the addition of dry low-fat phosphatide concentrates in the amount of 0.2, 0.4, 0.6 and 0.8 % by weight of flour. The results of the study are shown in Table 1.

It was found that when OLFLS was added in the amount of 0.8 % by weight of flour, the acidity of the dough increased by 0.2 degrees compared to the control and lower dosage of OLFLS. This led to the intensification of fermentation at this dosage, as evidenced by the greater accumulation of carbon dioxide both at the stage of proofing and during its proofing.

It has been found that the use of OLFLS increases the spreading of the dough ball by 4.4...16.6 % compared to the control, due to the fact that OLFLS is an ampholytic surfactant and interacts with gluten proteins of the dough, starch fraction, as well as with fat components to form complex compounds, which leads to a more even distribution of fat components in the dough and improved dough elasticity. This is confirmed by the improvement of the gas retention capacity, namely the specific volume of the dough increases with the increase in the dosage of OLFLS, but it is observed that at a dosage of 0.6 and 0.8 % by weight of flour, the specific volume of the dough is the same.

The study of the quality of finished products showed that the addition of OLFLS increases the specific volume of dough and weakens the gluten backbone. Thus, when 0.2% of flour was added, the specific volume increased by 1.9% compared to the control, when 0.4% was added, it increased by 6.5%, and when 0.6% and 0.8% were added, it increased by 9.1%. It was found that the shape stability and porosity of the products improved.

The calculation of the complex quality index showed that with an increase in the dosage of OLFLS, the quality of products increases, the highest quality index was obtained for samples with a dosage of OLFLS of 0.6 and 0.8 % by weight of flour, namely 87.8 points, which is 3.5 % higher than in the control.

Thus, the most effective dosage is 0.6 % by weight of flour, so further research on the effect of OLFLS on the consumer properties of products was carried out at this dosage.



**Table 1 - Influence of organic low-fat sunflower lecithin LECICO SUN P 400 on the quality of dough and finished products**

Indicators	Control (without additives)	Dosage of OLFLS, % by weight of flour			
		0,2	0,4	0,6	0,8
<i>Dough</i>					
Mass fraction of moisture, %.		43,5			
Titratable acidity, deg					
initial	1,0	1,0	1,0	1,0	1,2
Settling time, min		20			
Duration of proofing, min		45			
Specific volume of dough, cm <sup>3</sup>	140	144	150	156	156
Dough ball spreading, mm	90	94	98	102	105
Gas formation during the period of proofing and proofing, cm <sup>3</sup> /100 g	915	918	920	920	926
<i>Finished products</i>					
Specific volume, cm <sup>3</sup> /100 g	308	314	328	336	336
Porosity, %	80	82	83	84	84
Acidity, degree	1,2	1,2	1,2	1,2	1,4
Form resistance, H/D	0,45	0,46	0,46	0,48	0,48
Surface condition and colour	Smooth, uniform, golden yellow	Smooth, uniform, light yellow, shiny		Smooth, uniform, light brown, shiny	
Colour of the crumb	Light	With a grey tint		Light	
Porosity structure	Uniform, thin-walled	Uneven, thin-walled, coarse-porous			
Taste and aroma	Inherent in the products, without an off-flavour				
Comprehensive quality indicator, points	84,8	85,0	86,2	87,8	87,8

One of the most important consumer quality indicators is the degree of freshness of products, which is associated with the staling process of finished products. Staling is primarily associated with changes in the state of starch and protein during storage. For example, starch changes from an amorphous state to a crystalline state, i.e. starch retrogradation occurs, which is associated with the aggregation of amylopectin and amylose molecules.

An important role in this process is played by the aging of gluten denatured during the baking process, which releases moisture and, as a result, reduces its hydration capacity, leading to a densification of the crumb structure.

With the loss of freshness, physical and chemical changes in the crumb occur - compression resistance increases and elasticity decreases. Therefore, the duration of freshness preservation by the products was studied by changes in the structural and mechanical properties of the crumb. Its total deformation after 4 and 72 hours of storage on the AP 4/1 penetrometer, its crumbliness, and swelling were determined. The degree of staling was judged by determining the overall deformation of the crumb (Table 2).

According to the data obtained, the OLFLS has a positive effect on the preservation of freshness of products. Compared to the control, the degree of freshness preservation of products with OLFLS is 1.5 times higher.

**Table 2 - Changes in the structural and mechanical properties of the crumb of finished products.**

Indicators	Control (without additives)	Dosage of OLFLS, 0.6 % by weight of flour
Deformation of the crumb, unit after 4 hours:		
total	87	98
after 72 hours:		
total	24	46
Degree of freshness preservation, %.	27,6	43,9

Also, the degree of staling was investigated by the crumb crust after 4 and 72 hours. The results of the crumb crumbling test are shown in Fig.1.

The analysis of the results showed that, compared to the control, the value of crumbling decreases during storage for 72 h, provided that OLFLS is used.

To confirm the obtained regularities, the effect of OLFLS on the forms of moisture binding in the sold products was studied. The determination was carried out using a derivatograph with subsequent analysis of thermogravimetric curves (Table 3 and Fig. 2).

The analysis of bakery products showed (Fig. 2) that in the case of using 0.6 % by weight of OLFLS

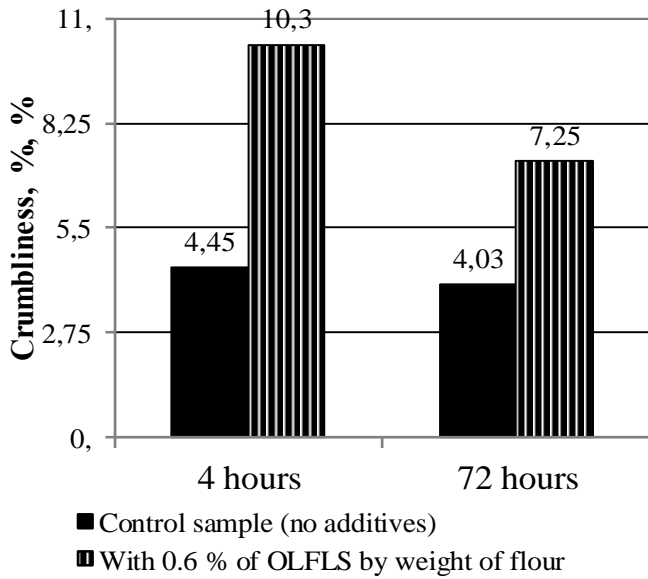


Fig. 1. The effect of organic low-fat sunflower lecithin on the crumb crumbling, %

Table 3 – Content of free and bound moisture in the crumb of finished products, %.

Bread samples	Storage time, h	Mass fraction of moisture, % of the total amount		Loss of bound moisture, %.
		free	bound	
Control sample (no additives)	4	75,9	24,1	5,9
	48	81,8	18,2	
With 0.6 % of OLFLS by weight of flour	4	74,6	25,4	4,6
	48	79,2	20,8	

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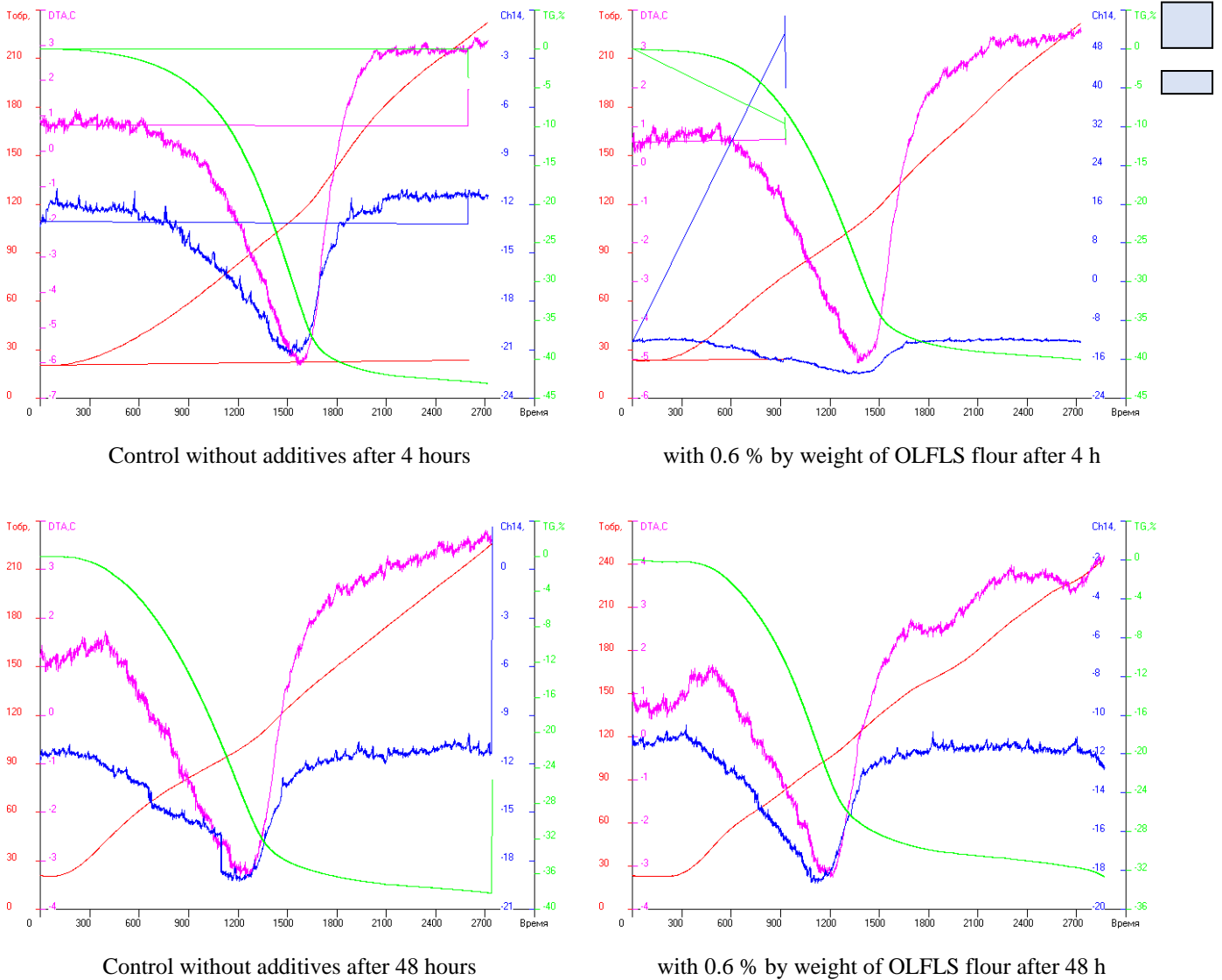


Fig. 2. Derivatograms of wheat bread during storage

After 24 hours



1

2

After 72 hours



1

2

**Fig. 3. Formation of a sub-crust layer:**
**1 - control without additives; 2 - with 0.6 % by weight of flour OLFLS.**

flour, the sub-crust layer after 72 h of storage is smaller compared to the sub-crust layer of the control product.

Table 3 shows that the initial content of bound moisture in products with 0.6 % by weight of flour with OLFLS is 2.9 % higher than in the control after 48 h of storage by 13.8 %, and the loss of bound moisture is 28.7% lower compared to the control. Thus, there is reason to believe that the use of OLFLS on the quality of bakery products will slow down the staling process.

During baking of bakery products, due to high temperatures, the surface of the products becomes more crispy compared to the crumb, which is explained by the creation of a gradient of relative humidity and moisture content between the crust and the crumb, which causes

the redistribution of moisture in the product. Multicomponent food products are characterised by the process of moisture migration between components. During storage, moisture migrates between the crust and the crumb. This causes softening of the crust and staling of the crumb and the formation of a thicker sub-crust layer. Therefore, further studies were conducted to investigate the formation of the sub-crust layer. The results of the study are shown in Fig. 2.

Based on laboratory baking and the calculation of a comprehensive quality indicator, it was found that 0.6 % by weight of flour with OLFLS is sufficient to improve the consumer properties of bakery products and

slow down the staling process of finished products during storage in unpackaged form for 72 hours.

As a result, the recipe for the organic loaf ‘Soniachyi’, was developed: high-grade wheat flour - 100 kg, bakery yeast - 3 kg, table salt - 1.3 kg, sugar - 2 kg, peasant sweet cream butter - 2.5 kg, organic low-fat sunflower lecithin LECICO SUN P 400 - 0.6kg.

The term ‘nutritional value’ reflects a set of useful qualities of the product, its ability to meet the physiological needs of the body for energy and essential nutrients that determine the functioning of the body: proteins, carbohydrates, fats, vitamins, minerals, and their digestibility.

**Table 4 – Chemical composition of 100 g of bread**

Composition of products	Organic loaf ‘Soniachyi’	Average daily requirement	Contained in 277 g of bread	Coverage of daily requirement
Proteins, g	8,36	67	23,16	34,5
Fats, g	2,82	68	7,81	11,5
included saturated fatty acids	1,00	-	-	-
Carbohydrates, g	53,90	392	149,30	38,1
included sugar	1,34	-	-	-
Dietary fibre, g	2,61	30	7,22	24,1
Ash, g	1,38	-	-	-
Salt (calculated from sodium)	1,24	-	-	-
Energy value, kcal	274,22	-	759,60	-
Bread units	4,5	-	-	-



The healthiness of bakery products is determined by their chemical composition, energy and biological value, physiological and organoleptic properties, digestibility and absence of harmful substances.

In order to determine the usefulness of the developed organic loaf 'Soniachyi', the content of the main nutrients was calculated.

The calculations were based on reference data on the chemical composition of raw materials [17] and data provided by the manufacturer of the organic raw materials used in the study, as well as the established norms of daily nutrient requirements. The results are presented in Table 3.

### Conclusions

The results of the experimental studies have established the feasibility of using organic low-fat sunflower

lecithin LECICO SUN P 400 in the amount of 0.6 % by weight of flour to improve the consumer properties of bakery products. It was found that the use of organic low-fat sunflower lecithin LECICO SUN P 400 prolongs the freshness of bakery products, namely, the degree of freshness preservation of the products increases by 1.5 times, which is confirmed by a lower degree of crumbling and the formed sub-crust layer during 72 hours of storage.

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### REFERENCES

- Chiriaco M.V., Grossi G., Castaldi S., Valentini R. The contribution to climate change of the organic versus conventional wheat farming: A case study on the carbon footprint of wholemeal bread production in Italy. *Journal of Cleaner Production*, 2017, Volume 153, Pages 309-319, ISSN 0959-6526. DOI: <https://doi.org/10.1016/j.jclepro.2017.03.111>.
- Cauvain S.P., Young L.S. *More Baking Problems Solved*. Cambridge: Woodhead Publishing Ltd, 2009.
- Povnotsoinne kharchuvannia: innovatsiini aspekty tekhnolohii, enerhoefektyvnoho vyrobnytstva, zberihannia ta marketynhu : kol. monohrafiia / za red. V.V. Yevlash, V.O. Potapova, N.L. Savyskoi ; Khark. derzh. un-t kharch. ta torh. – Kh.: KhDUKhT, 2015. – 580 s.
- Bairamov E.E. Polipshuvachi , shcho pidvysychuiut elastychnist i znyzhuiut roztiachnist kleikovyky i tista. *Kharchova promyslovist*, 2015, № 18, S. 13-18.
- Polodiuk V.S., Arsenieva L.Yu., Dotsenko V.F. Efektyvnist vykorystannia lecytynu v khlibopechenni. *Kharchovi tekhnolohii*, 2004, 9, 35-37.
- Sayty firmy LECICO: <https://www.lecico.de/firmenprofil/>.
- Regulation (EU) No 1333/2008 of the European Parliament and of the Council of 16 December 2008 on food additives.
- Dolynskiy A.A., Sharkova N.O., Avdeieva L.Yu., Zhukotskyi E.K. Novi mozhlyvosti vykorystannia lecytynu. *Naukovi pratsi [Odeskoi natsionalnoi akademii kharchovykh tekhnolohii]*, 2010, Vyp. 38(2), S. 160-163. Rezhym dostupu: [http://nbuv.gov.ua/UJRN/Np\\_2010\\_38\(2\)\\_42](http://nbuv.gov.ua/UJRN/Np_2010_38(2)_42).
- Drobot V.I. *Tekhnolohiia khlibopekarskoho vyrobnytstva*. Kyiv: Lohos, 2002. 365 s.
- Dulenko L.V., Horiainova Yu.A., Poliakova A.V., Malyhina V.D., Ditrikh I.V., Borzenko D.O.: *Navch. posib*. Kyiv: Kondor, 2012. 248 s. Format 60x84/16. ISBN 978-966-351-387-4.
- Burchenko L.M., Bilyk O.A., Kochubei-Lytvynenko O.V., Bondar V.I., Iskrytska V.O. *Tekhnolohichni efekty vykorystannia fosfatydneykh kontsentriativ u vyrobnytstvi khlibobulochnykh vyrobiv*. *Kharchova promyslovist*, 2018, T24, S. 40-47. URL: <http://dspace.nuft.edu.ua/jspui/handle/123456789/28906>.
- Helmerich G., Koehler P. Functional properties of individual classes of phospholipids in breadmaking. *Journal of Cereal Science*, 2005, Volume 42, Issue 2, Pages 233-241, ISSN 0733-5210. DOI: <https://doi.org/10.1016/j.jcs.2005.03.006>.
- Drobot V.I. *Dovidnyk z tekhnolohii khlibopekarskoho vyrobnytstva*. *Dovidnyk : navch. posib. / 2-e vyd., pererobl. i dopovn.* Kyiv: profKnyha, 2011. 580 s.
- Zhu F., Sakulnak R., Wang S. Effect of black tea on antioxidant, textural, and sensory properties of Chinese steamed bread. *Food Chemistry*, 2016, 194, 1217-1223.
- Tekhnolohiia khlibopekarskoho vyrobnytstva*. *Praktykum: navch. posibnyk [Text] / T.Ye. Lebedenko, H.F. Pshenyshniuk, N.Yu. Sokolova*. Odesa: Osvita Ukrainy, 2014. 392 s.
- Laboratornyi praktykum z tekhnolohii khlibopekarskoho i makaronnoho vyrobnytstva*. *Navchalnyi posibnyk / Drobot V.I., Arsenieva L.Yu., Bilyk O.A., Dotsenko V.F. ta in.* Kyiv: Tsentr navchalnoi literatury, 2006. 341 s.
- Perepelytsia O.P., Kochubei-Lytvynenko O.V., Ishchenko V.M., Petrenko T.V. *Khimichni sklad kharchovykh produktiv*. *Navch. posib*. Kyiv: NUHT, 2019. 102 s.



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## ВИКОРИСТАННЯ ЛЕЦИТИНУ ОРГАНІЧНОГО ПОХОДЖЕННЯ У ТЕХНОЛОГІЇ БУЛОЧНИХ ВИРОБІВ

### Анотація

Виробництво хлібобулочних виробів органічного походження мають обмеження у використанні різних інгредієнтів, насамперед 95 % рецептурного складу має бути органічного виробництва. На ринку продуктів органічного походження з'явився органічний знежирений соняшниковий лецитин LECICO SUN P 400 німецької фірми Lecico, що дає можливість розширити можливості покращання якості хлібобулочних виробів з маркуванням органічний продукт. Метою наукової роботи є розроблення рецептури органічного батону з подовженим терміном зберігання за рахунок використання органічного знежиреного соняшникового лецитину LECICO SUN P 400 німецької фірми Lecico та дослідити вплив його на споживчі характеристики органічного батону з подовженим терміном зберігання. На підставі пробних лабораторних випікань та розрахунку комплексного показника якості встановлено раціональне дозування органічного знежиреного соняшникового лецитину LECICO SUN P 400 в кількості 0,6 % до маси борошна, для забезпечення покращання споживчих властивостей булочних виробів. Так, у разі внесення 0,6 % до маси борошна питомий об'єм збільшився порівняно з контролем на 9,1 % за рахунок підвищення питомого об'єму тіста і послаблення клейковинного каркасу з внесення органічного знежиреного соняшникового лецитину LECICO SUN P 400. Встановлено, що покращується формостійкість та пористість виробів. Встановлено, що використання органічного знежиреного соняшникового лецитину LECICO SUN P 400 подовжує свіжість булочних виробів, а саме ступінь збереження свіжості виробів збільшується у 1,5 рази, що підтверджено меншим ступенем кришкватості та утворенням підкоринковим шаром протягом 72 год зберігання. З урахуванням раціонального дозування органічного знежиреного соняшникового лецитину LECICO SUN P 400 розроблено рецептуру органічного батону «Сонячний» борошно пшеничне вищого сорту органічного виробництва – 100 кг, дріжджів хлібопекарські пресовані – 3 кг, сіль кухонна харчова – 1,3 кг, цукор органічного виробництва – 2 кг, масло масло солодко-вершкове селянське органічного виробництва – 2,5 кг, органічний знежирений соняшниковий лецитин LECICO SUN P 400 – 0,6 кг

**Ключові слова:** органічний лецитин, батон, свіжість, органічне виробництво, підкоринковий шар.

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