

ORIGINAL RESEARCH PAPER

## APPROBATION AND BIOMEDICAL RESEARCH OF “CORIANDER PETROZELINE”

Viktoriia S. Kalyna<sup>1</sup>, Maryna V. Lutsenko<sup>2</sup>, Yuriy O. Tchoursinov<sup>1</sup>,  
Katerina V. Kunitsa<sup>3</sup>, Mykola M. Kharytonov<sup>1\*</sup>

<sup>1</sup>*Dnipro State Agrarian and Economic University, Ararian Engineering Faculty, Food Processing and Storage Department, 25, Serhii Yefremov st. 49027, Dnipro, Ukraine*

<sup>2</sup>*Oles Honchar National University, Chemistry Faculty, Food Technology Department, 72, Gagarin av., Dnipro, 49107, Ukraine*

<sup>3</sup>*Kharkiv Institute of Trade and Economics, Hotel and Restaurant Business Faculty, Innovation Food Technologies Department, 8, Otakara Yarosha st., Kharkiv, 61045, Ukraine*

\*Corresponding author: [envteam@ukr.net](mailto:envteam@ukr.net)

Received: February, 04, 2019

Accepted: April, 15, 2020

**Abstract:** The certain organoleptic and physicochemical properties of “Coriander petrozeline” were specified. Comparative analysis of bakery fat was conducted. It was established the semi-solid fraction of fatty coriander oil - the “Coriander petrozeline” can be defined as a special fat for baking. The expediency of using the “Coriander petrozeline” in the recipes of bakery products with the complete replacement of usual fatty ingredient - margarine was discovered. The test baked goods were made from the high quality wheat flour to determine the impact of “Coriander petrozeline” on the quality indicators of bakery products. The advantage of “Coriander petrozeline” using lies also in the fact that the technological process of manufacturing products does not change after its inception. The biomedical research of “Coriander petrozeline” was conducted by feeding it to laboratory rats. It was established that the results of biochemical studies of blood serum of white linear rats are within the limits of control healthy parameters of animals. It was proved that “Coriander petrozeline” is a hygienically safe food product and promising ingredient for application in the food industry.

**Keywords:** *biomedical, fatty oil, physicochemical, properties, semi-solid fraction*

## INTRODUCTION

At the present time, the oil-fat sector got confronted with a question of obtaining functional and useful fats from quality plant raw materials [1, 2]. This problem became the most acute due to the limited content of trans-isomers of monounsaturated fatty acids in food products, and hence the limited use of hydrogenated oils [3 – 6]. The problem of the shortage of confectionery, cooking, and bakery fats in Ukraine is solving largely through the use of imported products [7]. Therefore, the use of locally produced raw materials for the production of above-said fats without any chemical treatment is relevant and expedient [8 – 10]. We have previously obtained a special fat - “Coriander petrozeline” - as a result of fractional crystallization of fatty coriander oil (FCO). It was made according to the organoleptic and physicochemical parameters correspond to the baking fat that can be used in recipes of bakery products [11, 12]. The regulated melting point of such fats falls in the range of 17 - 27 °C, thus the fats obtained in all experiments meet the requirements of DSTU 4335:2004 standard. A food ingredient is considered safe when it does not contain acute and chronic toxicity, carcinogens, mutagens, teratogenic and gonadotoxic properties. Quality and safety parameters determine the usage of the food ingredient [13].

The main objectives were: a) to establish the possibility of using the “Coriander petrozeline” in food technologies; b) to evaluate product organoleptic, physical and chemical parameters; c) to determine the bakery products biomedical parameters.

## MATERIALS AND METHODS

Determination of organoleptic parameters, or more specifically taste, odor, color and consistency was conducted in accordance with DSTU 4335:2004 standard ("Confectionery, cooking, bakery and dairy fats. General specifications"). Determination of refractive index was made according to DSTU ISO 6320-2001 standard ("Animal and vegetable fats and oils. Determination of refractive index").

Determination of the mass fraction of fat, the mass fraction of moisture and volatile substances, the melting point, and the temperature of freezing of fat was made in accordance with DSTU 4463:2005 standard ("Margarines, confectionery and dairy fats. Acceptance rules and test methods").

Determination of acid-degree value was conducted in accordance with DSTU 4350:2004 standard ("Oils. Methods for determining the acid-degree value (ISO 660:1996, NEQ). Determination of peroxide index made in accordance with DSTU ISO 3960-2001 standard ("Animal and vegetable fats and oils").

Determination of peroxide index was made regarding to ISO 3960:1998, IDT" and DSTU 4570:2006 standard ("Vegetable fats and oils. Method for determining the peroxide index"). The determination of physicochemical and organoleptic parameters of bakery products was carried out in accordance with DSTU 7045:2009 standard ("Bakery products. Methods of determination of physicochemical parameters").

All institutional and national guidelines for the care and use of laboratory animals were followed. The experiment was performed according to the ethical guidelines for investigations in animal laboratory, and approved by Ethics Committee on Use of Animal Experimentation, School of Pharmacy, Medical Academy, Dnepr, Ukraine. In

the course of biomedical research, a set of parameters used for the studied products was identified. A set of parameters has been identified at the Scientific Research Centre of Biosafety and Environmental Control of Agro-Industrial Complex of Ukraine: total protein, albumins, globulins, protein factor, urea, urea nitrogen, creatinine, aspartate aminotransferase, alanine aminotransferase, de ritis index, alkaline phosphatase,  $\alpha$ -amylase, total bilirubin, glucose, calcium, inorganic phosphorus, Ca/P, total lipoprotein and cholesterol. The experiment on the determination of the biomedical parameters of the research sample was applied to six white outbred linear rats weighing 150 - 170 g and located in the laboratory of the Dnipro Medical Academy of the Ministry of Health of Ukraine.

Animals were kept in vivarium conditions at temperature of 20 – 22 °C and humidity of 40 – 60 %. "Coriander petrozeline" samples, obtained by the extraction refining of free fatty acids from FCO by 96 % ethyl alcohol followed by fractional crystallization, were used for research purposes. Animals were kept on a hungry diet for 6 - 8 hours before the research. The research oil samples were administered orally in an amount from 0.1 to 2.0 mL using a metal probe.

The blood samples of rats were taken 4 hours after the introduction of the research samples and delivered to the laboratory 20 minutes after the blood draw. After the introduction of the samples, the animals were observed for 5 days, taking into account their general condition, the condition of the fur, and the sensitivity to external excitants. It was found that no rat died during the experiment. During the whole experiment, the animals did not display inadequate behavioral reactions.

## RESULTS AND DISCUSSION

### Approbation of "Coriander petrozeline" in the receipts of bakery products

"Coriander petrozeline" is the one of the products of complex processing of FCO in accordance with the developed technical instructions (TI 21799332-001-2015). It has a melting point of 19 ÷ 25 °C. It gives reasons to investigate its use as baking fats. The comparative analysis of the quality parameters of "Coriander petrozeline", obtained through the developed technology, is given in Table 1.

The research of the technology of the production of "Plyushka" bakery products using a semi-solid fraction - "Coriander petrozeline" - was carried out in the production testing laboratory of "Ridna Palyanitsa LLC" in Dnipro.

The research samples were prepared using the high-grade wheat flour, pressed bakery yeasts, white cooking salt, fat with complete replacement of margarine with "Coriander petrozeline".

The recipe ratios of the dough ingredients for the production of "Plyushka" bakery products are presented in Table 2.

**Table 1.** Organoleptic and physicochemical parameters of “Coriander petrozeline”

Parameter name	Bakery fat in accordance with DSTU 4335:2004	“Coriander petrozeline”
Odor and taste	Clean palate. The scent of the introduced flavoring agent	No taste, no foreign smell and bitterness
Color	Light yellow to yellow	Light yellow
Consistency	Homogeneous	Homogeneous
Mass fraction of fat [%]	> 99.70	99.95 ÷ 99.97
Mass fraction of moisture and volatile substances [%]	< 0.30	0.03 ÷ 0.05
Acid - degree value [mg KOH·g <sup>-1</sup> ]	< 0.8	0.4 ÷ 0.5
Melting point [°C]	17.00 ÷ 27.00	19.17 ÷ 25.48
Freezing point [°C]	not higher than 15.00	14.48 ÷ 14.90
Peroxide index [mmol ½O·kg <sup>-1</sup> ]	5.00	4.02 ÷ 4.05

**Table 2.** The recipe for making dough for "Plyushka" bakery products

Recipe ingredient name	Raw materials consumption per 100 kg of flour [kg]	
	Control sample	Research sample
High-grade wheat flour	100.0	100.0
Yeasts	3.0	3.0
Salt	0.70	0.70
Sugar	23.0	23.0
Egg	2.0	2.0
Margarine	10.0	–
“Coriander petrozeline”	–	7.2
Vanilline	0.1	0.1

The research samples of bakery products are shown in Figure 1. The organoleptic and physicochemical parameters of the research samples of "Plyushka" bakery products were determined according to the DSTU - P 4587 standard methods, specified in Table 3.

According to the obtained organoleptic and physicochemical parameters, the bakery products after complete replacement of fat raw materials with the semi-solid fraction of FCO - “Coriander petrozeline” - in the recipe, meet the requirements of the current normative documentation and stand out by much better physicochemical parameters.



**Figure 1.** Research samples of "Plyushka" bakery products

**Table 3.** Organoleptic and physicochemical parameters of "Plyushka" bakery products after introducing the "Coriander petrozeline" into the recipe

Parameter name	Parameter		
	Parameters according to SSU-P 4587 standard	Control sample	Research sample
Shape	Conforms to the type of product	+	+
Surface	Conforms to the type of product	+	+
Color	Light brown, without burnt hints	Brown, without burnt hints	Brown, without burnt hints
Crumb condition	Thoroughly baked, not wet to the touch, without traces of under mixing	+	+
Taste	Typical for this type of products, without foreign taste	+	+
Odor	Typical for this type of products, without foreign odor	+	+
Crumb moisture [%]	< 37.0	32.8	32.7
Crumb acidity [degree]	< 2.5	2.1	2.1
Mass fraction dry matter [%]	sugar	9.7 ± 1.0	10.2
	fat	4.3 ± 0.5	4.2

The moisture and acidity parameter are lower than those specified by the normative documentation. Therefore, "Coriander petrozeline" can be used in bakery products as baking fat.

**Biomedical research of parameters of “Coriander petrozeline”**

The results of the biochemical analysis of blood serum of white linear rats are presented in Table 4.

**Table 4.** Results of complex biochemical research of blood parameters of rats

Parameter	Results						Normal range
	Sample №*						
	1	2	3	4	5	6	
Total protein [g·L <sup>-1</sup> ]	70.0	76.0	75.0	72.0	71.0	68.5	72.5 ± 3.5
Albumins [g·L <sup>-1</sup> ]	31.0	32.0	31.0	33.0	33.0	30.0	30.5 ± 4.5
Globulins [g·L <sup>-1</sup> ]	39.0	44.0	44.0	39.0	38.0	33.5	41.5 ± 8.5
Protein ratio [unit]	0.86	0.77	0.78	0.91	0.93	0.98	0.78 ± 0.28
Urea [mmol·L <sup>-1</sup> ]	7.90	8.92	8.90	8.92	8.92	9.70	8.95 ± 1.75
Urea nitrogen [mg %]	34.4	31.5	30.8	33.5	32.4	31.8	34.5 ± 3.5
Creatinine [μmol·L <sup>-1</sup> ]	82.0	79.0	71.0	81.0	104.0	87.0	86 ± 18
Aspartate aminotransferase [unit·L <sup>-1</sup> ]	162.0	174.0	163.0	175.0	177.0	120.0	134 ± 62
Alanine aminotransferase [unit·L <sup>-1</sup> ]	129.0	107.0	122.0	122.0	145.0	122.0	125 ± 15
De Ritis ratio [unit]	1.26	1.63	1.34	1.43	1.22	0.98	1.05 ± 0.35
Alkaline phosphatase [unit·L <sup>-1</sup> ]	255.0	277.0	210.0	275.0	293.0	235.0	204 ± 86
α-amylase [g·L <sup>-1</sup> ]	121.0	110.8	143.6	122.1	129.2	100.5	120 ± 40
Total bilirubin [μmol·L <sup>-1</sup> ]	4.2	4.1	3.4	3.6	4.0	4.0	5.2 ± 1.9
Glucose [mmol·L <sup>-1</sup> ]	5.58	5.92	5.83	5.20	5.60	5.96	5.97 ± 0.92
Calcium [mmol·L <sup>-1</sup> ]	2.12	2.48	2.38	2.52	2.37	2.56	2.51 ± 0.16
Inorganic phosphorus, [mmol·L <sup>-1</sup> ]	2.8	3.1	2.5	2.4	2.9	2.7	3.01 ± 0.78
Ca/P [unit]	0.8	0.8	0.9	1.1	0.8	0.9	0.9 ± 0.2
Total lipoprotein [mg %]	693	713	804	492	788	720	600 ± 200
Cholesterol [mmol·L <sup>-1</sup> ]	1.60	1.53	1.36	1.39	1.67	1.44	1.7 ± 0.4

The data in Table 4 indicate that the biochemical parameters are within the normal range.

**CONCLUSIONS**

The organoleptic and physicochemical properties of “Coriander petrozeline” were researched and a comparative analysis with baking fat was carried out. It is established that in accordance with DSTU 4335 the semi - solid fraction of fatty coriander oil - the “Coriander petrozeline” - can be defined as a special fat of baking purpose.

The expediency of using the “Coriander petrozeline” in the recipes of "Plyushka" ("Bun") bakery products with the complete replacement of usual fatty ingredient - margarine was discovered. The test baked goods were made from the high quality wheat flour to determine the impact of “Coriander petrozeline” to get the quality indicators of

bakery products. The organoleptic and physicochemical parameters of the obtained bakery products were determined in comparison with the DSTU - P 4587 and the control samples.

It was concluded from the obtained data that bakery products containing "Coriander petrozeline" meet the requirements of the normal rate. According to quality criteria are every bit as good as the baking products with traditional fatty raw materials, and in some cases, even exceed them. The advantage of using "Coriander petrozeline" lies also in the fact that the technological process of manufacturing products does not change after its inception. Thus, the research of "Coriander petrozeline" as a fat component for the production of bakery products confirmed the possibility and feasibility of its use.

The biomedical research of "Coriander petrozeline" was conducted by feeding it to laboratory rats. It was established that the results of biochemical studies of blood serum of white linear rats are within the limits of control parameters for healthy animals.

It was proved that "Coriander petrozeline" is as a hygienically safe food product and a promising ingredient for introduction into the food industry.

## ACKNOWLEDGMENTS

The work has been funded by the Ukrainian Ministry of Education and Science.

## REFERENCES

1. Charvet, A.S., Comeau, L.C., Gaydou, E.M.: New preparation of pure petroselinic acid from fennel oil (*Foeniculum vulgare*), *Journal of the American Oil Chemists Society*, **1991**, 68 (8), 604-607;
2. Sahib, N.G., Anwar, F., Gilani, A.H., Hamid, A.A., Saari, N., Alkharfy, K.M.: Coriander (*Coriandrum sativum* L.): a potential source of high value components for functional foods and nutraceuticals. A review, *Phytotherapy Research*, **2013**, 10 (27), 1439-1456;
3. Crengros, J.: The refining of sunflower oil, *International Journal of Oil and Fats*, **1994**, 6, 19-23;
4. Hodgson, S.A.: Alkali refining of soybean oil using, *International news on fats oils and related materials*, **1995**, 4 (6), 425-426;
5. Normah, I., Cheow, C.S., Chong, C.L.: Crystal habit during crystallization of palm Oil: Effect of time and temperature, *International Food Research Journal*, **2013**, 20 (1), 417-422;
6. Shavandi, M.A., Haddadian, Z., Ismail, M.H.S.: *Eryngium foetidum* L. *Coriandrum sativum* and *Persicaria odorata* L.: a review, *Asian Journal of Scientific Research*, **2012**, 8 (2), 410-426;
7. Kunitsa, E., Udovenko, O., Litvinenko, E., Gladkiy, F., Levchuk, I.: Technology of specialty fats based on palm stearin, *Eastern-European Journal of Enterprise Technologies*, **2015**, 1729-3774;
8. Clodoveo, M.L.: New advances in the development of innovative virgin olive oil extraction plants: looking back to see the future, *Food Research International*, **2013**, 54, 726-729;
9. Clodoveo, M.L., Hachicha Hbaieb, R., Kotti, F., Scarascia Mugnozza, G., Gargouri, M.: Mechanical strategies to increase nutritional and sensory quality of virgin olive oil by modulating the endogenous enzyme activities, *Comprehensive Reviews in Food Sciences and Food Safety*, **2014**, 13, 135-154;
10. Costagli, G., Betti, M.: Avocado oil extraction processes: method for cold-pressed high-quality edible oil production versus traditional production, *Journal of Agricultural Engineering*, **2015**, 46 (3), 115-122;

11. Kalyna, V.S., Lytsenko, M.V., Kharytonov, M.M.: Feasibility study of the technology of fatty coriander oil complex processing, *Annals of Agrarian Science*, **2018**, 16 (2), 95-100;
12. Latip, R.A., Lee, Y.Y., Tang, T.K., Phuah, E.T., Tan, C.P., Lai, O.M.: Physicochemical properties and crystallisation behaviour of bakery shortening produced from stearin fraction of palm - based diacylglycerol blended with various vegetable oils, *Food Chemistry*, **2013**, 15 (4), 3938-3946;
13. Shukla, A., Satya, P.S., Tiwari, S.: Transformation of toxic potential of *Jatropha curcas* (Ratanjyot) into protein source: A mini-review, *Journal of Advanced Veterinary and Animal Research*, **2015**, 2 (2), 89-94.