

Tkachenko, Alina; Syrokhman, Ivan; Huba, Liudmyla et al.

## Article

# Quality control and identification of organic biscuits

Technology audit and production reserves

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*Reference:* Tkachenko, Alina/Syrokhman, Ivan et. al. (2021). Quality control and identification of organic biscuits. In: Technology audit and production reserves 1 (3/57), S. 39 - 44.  
<http://journals.urau.ua/tarp/article/download/225531/225534/514393>.  
[doi:10.15587/2706-5448.2021.225531](https://doi.org/10.15587/2706-5448.2021.225531).

This Version is available at:

<http://hdl.handle.net/11159/6816>

## Kontakt/Contact

ZBW – Leibniz-Informationszentrum Wirtschaft/Leibniz Information Centre for Economics  
Düsternbrooker Weg 120  
24105 Kiel (Germany)  
E-Mail: [rights\[at\]zbw.eu](mailto:rights[at]zbw.eu)  
<https://www.zbw.eu/>

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**Alina Tkachenko,  
Ivan Syrokhman,  
Liudmyla Huba,  
Yulia Basova,  
Khrystyna Kovalchuk**

## QUALITY CONTROL AND IDENTIFICATION OF ORGANIC BISCUITS

*The object of research is children's spelled biscuits Holle (Germany) and Belgian children's biscuits with pieces of Fleur Alpine chocolate (Belgium). Consumers often buy organic-branded traditional food products through unfair advertising and labeling violations. Due to the fact that organic products are often the subject of counterfeiting, quality expertise is especially important. Also, thanks to the conformity assessment of the labeling given in the work, it is possible to establish whether the product is really organic. The labeling of biscuits was analyzed for compliance with the Law of Ukraine «On Organic Production» and the Law of Ukraine «On Information for Food Consumers». The study showed that the labeling complies with legal requirements in both samples. It was also found that both samples of biscuits meet the requirements of regulatory documents for organoleptic indicators. Organoleptic characteristics were tested: shape, surface, color, taste and smell, appearance in the fault. The tasting assessment was carried out according to a 45-point scale developed by the authors. The total number of points in the tasting score, taking into account the weight factor, for Fleur Alpine biscuits was 39.96, which corresponds to a quality level of 0.88; and Holle biscuits – 44, with a quality level of 0.97. Both samples meet the requirements of regulatory documents for such physicochemical indicators as humidity, alkalinity and moisture content. The moisture content of the biscuits was determined in an accelerated manner in an oven. Wetness was determined by the ratio of the weight of the items after wetting to the weight of the dry items. Alkalinity was determined by titration of the product filtrate. The moisture content for Fleur Alpine biscuits was 9.3 % and for Holle biscuits it was 8.0 %. The alkalinity was 1.6 and 1.4 degrees, respectively, and the wetness was also within the normal range with values of 120 and 110 %. The results indicate the quality of the studied samples in terms of organoleptic and physicochemical indicators.*

**Keywords:** organic products, organic production, organic biscuits, organoleptic indicators, biscuit labeling, physical and chemical indicators.

Received date: 22.09.2020

Accepted date: 20.11.2020

Published date: 26.02.2021

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### 1. Introduction

It should be noted that the main trends in the global market for organic products have become an increase in demand for organic products in most countries. The situation in the global organic market is characterized by the concentration of demand in developed countries, an increase in demand in developing countries, consolidation of market participants and the development of distribution [1].

However, the unresolved issue is the compliance of the quality of organic products, the falsification of organic products on the market, the study of quality and food safety indicators and their comparison with traditional products.

In 2007, European Union Regulation (EC) 834/2007 introduced principles and criteria for the processing of organic food. This document sets out the goals and principles of organic production. One of the production goals is to create high quality organic products [2]. The main problem in the study of organic food products is the need to select methods for determining the quality, as well as determining the quality parameters of organic products [3]. It should be noted that national standards do not regulate the quality of organic products. Previous studies suggested the creation

of a draft national standard «Organic production. General requirements» [4]. But this standard proposes to establish criteria for production, and not for quality parameters of finished products.

Certification of organic products is an effective tool for protecting consumers from counterfeiting. Organic certification gives the manufacturer the right to label products using marks confirming their origin from organic farming [5, 6]. However, in this context, the issue of violation of labeling requirements and misleading consumers remains unresolved. Considering the above, quality control and identification of organic products is a timely and urgent task.

### 2. The object of research and its technological audit

*The object of research is organic children's spelled biscuits Hole, Germany (Fig. 1) and Belgian children's biscuits with pieces of Fleur Alpine chocolate, Belgium (Fig. 2).*

Fig. 1 shows that the composition of the Children's spelled biscuits Holle:

- spelled flour 63 %;
- rice syrup;

- butter (dairy product);
- banana powder;
- baking powder sodium bicarbonate;
- vitamin B1.



Fig. 1. Children's spelled biscuits Holle

Contains gluten, milk. May also contain traces of nuts, eggs, sesame seeds, soy. Energy value per 100 g: 1851 kJ/440 kcal. Nutritional value per 100 g: fat – 12.8 g, including saturated – 8.5 g; carbohydrates – 70.1 g, of which sugar – 14.80 g, protein – 9.2 g, salt – 0.2 g. Method of preparation: open the package, stir before use and feed. After opening the package, store in the refrigerator and consume within 2 days. Storage conditions: store in a cool dry place.



Fig. 2. Belgian children's biscuits with pieces of Fleur Alpine chocolate

Fig. 2 it can be seen that the composition of the Belgian children's biscuits with pieces of Fleur Alpine chocolate:

- whole grain wheat flour;
- unrefined cane sugar;
- non-hydrogenation vegetable oils (sunflower, cocoa butter);
- 8 % chocolate chips (unrefined cane sugar, cocoa mass, cocoa butter);
- rice flour;
- egg;
- skimmed milk powder;
- baking powder (sodium bicarbonate);

- natural vanilla extract;
- antioxidant (tocopherol).

The packaging indicates that the product may contain traces of soybeans and nuts. The energy value of the biscuit is 1880 kJ/447 kcal. Nutritional value: fats – 18 g, including saturated fatty acids – traces; carbohydrates – 60.8 g, including sucrose – 23 g; dietary fiber – 3.2 g; proteins – 7.5 g, salt – 0.3 g. Net weight: 150 g (6 servings in individual packaging, 25 g each). Expiration date: 15 months. Storage conditions: store at a temperature not exceeding 25 °C and relative humidity not exceeding 75 %. Use an open sachet within 24 hours.

### 3. The aim and objectives of research

The aim of research is to study the quality of organic biscuits in terms of organoleptic and physicochemical indicators and compliance with labeling. Given this aim, the objectives of research are:

1. Analyze the labeling of organic biscuits.
2. Conduct barcode identification of organic biscuits.
3. Investigate the organoleptic characteristics of the quality of organic biscuits.
4. Determine the physical and chemical indicators of the quality of organic biscuits.

### 4. Research of existing solutions of the problem

Previous studies have established that the demand for sweets made from natural ingredients, in particular organic products, is growing now [7]. At the same time, there are many cases of food counterfeiting. A high level of standards and technical and other requirements can not only more reliably protect the market from low-quality goods, but also become an incentive for the growth of manufacturers' competitiveness [8]. Certain countries have organic product standards. At the same time, many countries adhere to the Codex Alimentarius standards [9].

The labeling of organic products deserves special attention during identification. A new EU regulation on the labeling of organic products is currently under discussion. It proposes a stricter policy on pesticide residues in organic products. In particular, if these are pesticide residues that are not permitted in organic agriculture, the sale of such products is prohibited for 2 months until the source of pollution is identified [10].

Many studies point to the great health benefits of organic foods. It has been found that organic food contains less harmful substances, and the risk of allergies decreases with their long-term consumption [11]. Available studies of comparative analysis of nutritional and biological value of organic and traditional food products. Thus, there are data on the comparative analysis of studies of the quality of organic and conventional food products – yogurt, cheese, green vegetables produced in Bulgaria, and a conceptual model for comparative testing of product quality has been proposed [12]. There is evidence that people who consume exclusively organic products and have a lower risk of obesity [13]. Organic products are only gaining popularity in some countries [14]. Along with this, it should be noted that despite the benefits of organic products, a significant part of consumers remains aware of what kind of products are organic [15]. This is the reason for the small number of consumers of organic products. The survey [16], in which

566 respondents took part, found that organic products are consumed mainly by people who adhere to a healthy lifestyle. At the same time, research data [17] show that the demographic profile of organic buyers is not related to income, age, or family size, but to educational level.

The development of new recipes and the study of the quality of flour confectionery products are devoted to the previous works of the authors. These studies describe the search for new formulations from organic raw materials and proposed studies of quality, safety and biological value:

- cakes [18];
- biscuits [19];
- cupcakes [20].

It has been established that organic products are distinguished by a lower content of toxic compounds and a high content of useful nutrients. However, the proposed studies did not address the quality problems of the existing range of organic products sold on the market.

## 5. Methods of research

Organic products can be labeled on the packaging only if there is a corresponding certificate [21]. Organic products are those that are 95 % made from organic raw materials [22]. That is why, the first stage of the examination of organic biscuits was the analysis of the labeling for compliance with the requirements of Ukrainian legislation.

Labeling – words, descriptions, signs for goods and services (trade marks), graphics or symbols related to food, which are placed on any packaging. In the absence of packaging, in a document or message accompanying or referring to the food product. The conformity of the biscuit labeling has been twisted according to the requirements of the Law of Ukraine «On information for consumers regarding food products» [23].

A mandatory element for labeling organic products is the code number, which is placed under the state logo for organic products:

1. Acronym that identifies the state of origin.
2. The inscription «organic».

3. Registration code of the certification body, which has completed the certification of organic production [24].

In order to ensure that the printed acronyms and codes of the certification bodies are correct, a check was carried out on the Organic Farming Information System website [25].

An important requirement for the production of organic food is the identification of each batch of such products. Sampling was carried out in accordance with DSTU 5904:2006 «Confectionery products. Acceptance rules, methods of sampling and sample preparation». Organoleptic analysis was carried out according to the following parameters: appearance, taste, smell, and appearance in the fault [26].

The moisture content of the biscuits is determined by drying to constant weight at a temperature of  $130 \pm 2$  °C for 40 minutes according to DSTU 4910:2008 «Confectionery products. Methods for Determination of Moisture and Dry Substances».

The alkalinity of biscuits was determined according to DSTU 5024:2008 «Confectionery products. Methods for determination of acidity and alkalinity».

The wetness of the biscuits was determined according to DSTU 5023:2008 «Confectionery products. Method for determining wetness».

## 6. Research results

Analysis of the labeling for compliance with the Law of Ukraine «On information for food consumers» and the Law of Ukraine «On organic production» are presented in Table 1.

**Table 1**

Organic biscuit labeling analysis

Mandatory information element on the label	Belgian children's biscuits with pieces of Fleur Alpine chocolate	Children's spelled biscuits Holle
1	2	3
1. Name of the food	Belgian children's biscuits with pieces of Fleur Alpine chocolate	Children's spelled biscuits Holle from 8 months
2. List of ingredients	Whole wheat flour, unrefined cane sugar, non-hydrogenated vegetable oils (sunflower, cocoa butter), chocolate chips (8 %) (unrefined cane sugar, cocoa mass, cocoa butter), rice flour, egg, skimmed milk powder, sodium bicarbonate (bicarbonate), natural vanilla extract, antioxidant (tocopherol) [27]	Spelled flour 63 %, rice syrup, butter (dairy product), banana powder, baking powder, sodium bicarbonate, vitamin B1. Contains gluten, milk [27]
3. Any ingredients or processing aids used in the production or preparation of a food product and remain present in the finished product, even in a modified form	May contain traces of soybeans and nuts	May contain traces of nuts, eggs, sesame seeds, soy
4. Amount of specific ingredients or ingredient categories	–	–
5. Amount of food product in established units	Net weight 150 g	Net weight 150 g
6. Minimum expiry date or «take-to» date	10.04.2021	25.05.2021
7. Any special conditions of storage and/or use (if necessary)	Store at a temperature not exceeding 25 °C and a relative humidity not exceeding 75 %. After opening the package, use within 1 day	Store in a cool dry place. After opening the package, consume within 3–4 weeks
8. Name and location of the food market operator	LLC «Eita Natur Organic», Dnipro, Ukraine	Wine Bureau LLC, Kyiv, Ukraine
9. Country of origin or place of origin	Fleur Alpine, Belgium	Wikana Keks und Nahrungsmittel, Germany for Holle baby food GmbH, CH-4125, Reichen, Baselstrasse 11 Switzerland
10. Instructions for use – if the absence of such instructions makes it difficult to properly use the food	Belgium	–



**Continuation of Table 1**

1	2	3
11. For drinks with an ethyl alcohol content of more than 1.2 % by volume – the actual alcohol content in the drink	Method of preparation: the product is ready to eat	–
12. Information on the nutritional value of the food	–	Energy value 1894 kJ/450 kcal. Fat – 14.0 g, including Saturated fatty acids – 8.3 g. Carbohydrates – 79.5 g, including Sucrose – 14.6 g. Dietary fiber – 3.5 g. Proteins – 8.8 g. Salt – 0.2 g. Thiamin (mg) – 66
Additional labeling requirements for organic products		
1. Acronym that identifies the state of origin	BE-BIO-01	DE-ÖKO-001
2. The inscription «organic»	+	+
3. Registration code of the certification body, made the certification of organic production	+	+

So, product labeling complies with Ukrainian legislation. In order to make sure that the applied acronyms and codes of certification bodies are correct, a check was carried out on the site of the Organic Farming Information System [25] (Fig. 3, 4).

It has been established (Fig. 3) that biscuits are produced in Belgium in Brussels, as indicated on the package.

For Holle biscuits, the information is shown in Fig. 4.

Belgium

Code	Name and Address	Comments
BE-BIO-01	CERTISYS Av. de l'Esclime 85 Schermlaan B-1150 Bruxelles - Brussel Bureau: Rue Joseph Bouché 57/3 B-5310 Bolinne Tel: +32 (0) 81 60 03 77 Fax: +32 (0) 81 60 03 13 E-mail: info@certisys.eu	System A BCR, FL, WA

**Fig. 3.** Checking the Fleur Alpine biscuit information

Germany

Code	Name and Address	Comments
DE-ÖKO-001	BCS Oeko-Garantie GmbH Marienortgraben 3-5 D-90402 Nürnberg Tel: +49 (0)911 424390 Fax: +49 (0)911 492239 E-mail: info@bcs-oeko.de	System A

**Fig. 4.** Checking the acronym for Holle biscuits

So, it has been established that organic biscuits meet the requirements of the Law of Ukraine «On information for consumers regarding food products» in terms of labeling and contains the necessary information to designate organic products in accordance with the Law of Ukraine «On organic production».

Barcoding is the dominant technology for automatic identification, and the barcode symbol is the most important component of this technology, the basis of data for automatic processing [28].

That is why, in the course of the study, the barcode was deciphered with the employer of the site [29] (Fig. 5).

So, according to the code decryption information, the product is made in Switzerland, and the check numbers match. The information provided on the packaged products indicates that the goods were made in Germany, but ordered by a Swiss company.

The code for the Fleur Alpine biscuits was deciphered in a similar way (Fig. 6).

Расшифровка штрих кода - онлайн расшифровка

Штрих код:    
Введите штрих код, всего 13 цифр.

**Штрих код успешно расшифрован:**

Код: 7640104959595	✓
Страна: Швейцария	
Код изготовителя: 0104	
Код товара: 95959	
Контрольная сумма: Соппадает	✓

**Fig. 5.** Decoding the barcode of Holle biscuits

Расшифровка штрих кода - онлайн расшифровка

Штрих код:    
Введите штрих код, всего 13 цифр.

**Штрих код успешно расшифрован:**

Код: 5412916941172	✓
Страна: Бельгия и Люксембург	
Код изготовителя: 2916	
Код товара: 94117	
Контрольная сумма: Соппадает	✓

**Fig. 6.** Decoding the barcode of Fleur Alpine biscuits

So, according to [29], the country of origin of the product is Belgium and Luxembourg, as indicated on the package. Check digits match. The appearance of Fleur Alpine biscuits is shown in Fig. 7.



**Fig. 7.** Fleur Alpine Biscuits

The appearance of Holle biscuits is shown in Fig. 8.



**Fig. 8.** The appearance of Holle biscuits

The examination of biscuits for organoleptic indicators was carried out in accordance with DSTU 3781:2014 [19]. The characteristics of the organoleptic characteristics of the biscuits are given in Table 2.

Organoleptic analysis of organic biscuits

**Table 2**

Indicator name	Fleur Alpine	Holle
Shape	correct, fantasy, oval not clear	regular, rectangular, patterned, smooth edges
Surface	smooth interspersed with pieces of chocolate, not burnt, without splashes of crumbs	smooth with a clear pattern, without inclusions of crumbs
Colour	beige, uniform	light beige, uniform
Taste and smell	pleasant crunchy taste with hints of chocolate, without foreign smell and taste	pleasant taste with the aroma of milk and bananas, without foreign smell and taste
Fault view	baked with uniform porosity without voids and traces of non-targeting	baked with uniform porosity without voids and traces of non-targeting

Table 3 shows the results of the study of products on a 45-point scale developed by the authors [26].

The results of the study of products on a scale

**Table 3**

No.	Indicator	Weight factor	Fleur Alpine	Holle
1	Shape	1	4.8	5.0
2	surface	1	4.9	5.0
3	Colour	1	4.36	4.1
4	Appearance	1	5	5
5	Fault view	1	4.9	4.9
6	Consistency	0.5	5/2.5	5/2.5
7	Smell	1.5	5/7.5	5/7.5
8	Taste	2	5/10	5/10
The total number of points taking into account the weighting factor			39.96	44
Quality level			0.88	0.97

Having processed the results of laboratory research, it can be concluded that the tested samples of organic biscuits meet the requirements of the DSTU 3781:2014 standard «Biscuits. General technical requirements by organoleptic

indicators». The total score for the Fleur Alpine biscuits was 39.96, which corresponds to a quality level of 0.88; and Holle biscuits – 44, with a quality level of 0.97.

The results of the study of physical and chemical parameters are shown in Table 4.

**Table 4**

Results of the study of physical and chemical indicators

Indicator	Norm	Fleur Alpine	Holle
Humidity, %	10 ± 2	9.3	8.0
Alkalinity, deg.	No more than 2.0	1.6	1.4
Wetness, %	Less than 110	120	110

So, both samples meet the requirements of the standard in terms of such physicochemical indicators as humidity, alkalinity and moisture content. The humidity for Fleur Alpine biscuits was 9.3 % and for Holle biscuits it was 8.0 %. The alkalinity was 1.6 and 1.4 degrees, respectively, and the wetness was also within the normal range with values of 120 and 110 %.

## 7. SWOT analysis of research results

*Strengths.* Research on organic biscuits has shown that the labeling meets the requirements of current legislation. The barcode is applied correctly, as evidenced by the results of barcode identification according to the source [29]. It was found that both samples meet the requirements of the standard, both in terms of organoleptic and physicochemical indicators.

*Weaknesses.* Since organic products are distinguished precisely by the best indicators of safety, the weakness of the study is that these indicators have not been studied and compared with biscuits of traditional technology.

*Opportunities.* Opportunities for further research are in the development of new formulations of organic biscuits based on the study of the existing range. Market research and expansion of the range of organic products is interesting for many countries of the world, despite the growing popularity of ecological and healthy food.

*Threats.* It should be noted that the production of organic products is more expensive, so every consumer can afford to buy such food. That is why the market for organic products is still limited.

## 8. Conclusions

1. It has been established that organic biscuits meet the requirements of the Law of Ukraine «On information for consumers regarding food products» in terms of labeling and contain the necessary information to designate organic products in accordance with the Law of Ukraine «On organic production».

2. Using the source [29], the bar coding of both biscuit samples was deciphered and it was established that the check digits of the codes coincide, and the biscuits were produced in the same countries as indicated on the labeling.

3. The results of the study of products on a 45-point scale are shown. The total number of points in the tasting score, taking into accounts the weight factor, for Fleur Alpine biscuits was 39.96, which corresponds to a quality level of 0.88; and Holle biscuits – 44, with a quality level of 0.97.

4. It was revealed that both samples meet the requirements of regulatory documents in terms of such physicochemical indicators as humidity, alkalinity and moisture content. The moisture content of the biscuits was determined in an accelerated manner in an oven. Wetness was determined by the ratio of the weight of the items after wetting to the weight of the dry items. Alkalinity was determined by titration of the product filtrate, 9.3 % for Fleur Alpine and 8.0 % for Holle biscuits. The alkalinity was 1.6 and 1.4 degrees, respectively, and the wetness was also within the normal range with values of 120 and 110 %.

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**Alina Tkachenko**, PhD, Associate Professor, Department of Commodity Research, Biotechnology, Examination and Customs, Poltava University of Economics and Trade, Poltava, Ukraine, ORCID: <http://orcid.org/0000-0001-5521-3327>, e-mail: [alina\\_biaf@ukr.net](mailto:alina_biaf@ukr.net)

**Ivan Syrokhman**, Doctor of Technical Sciences, Professor, Department of Commodity Science, Technologies and Food Quality Management, Lviv University of Trade and Economics, Lviv, Ukraine, ORCID: <http://orcid.org/0000-0002-0467-4198>, e-mail: [syrokhman@ukr.net](mailto:syrokhman@ukr.net)

**Liudmyla Huba**, PhD, Associate Professor, Department of Commodity Research, Biotechnology, Examination and Customs, Poltava University of Economics and Trade, Poltava, Ukraine, ORCID: <https://orcid.org/0000-0003-1008-6023>, e-mail: [lyudmika@gmail.com](mailto:lyudmika@gmail.com)

**Yulia Basova**, PhD, Associate Professor, Department of Commodity Research, Biotechnology, Examination and Customs, Poltava University of Economics and Trade, Poltava, Ukraine, ORCID: <http://orcid.org/0000-0003-4057-7712>, e-mail: [basovay5@gmail.com](mailto:basovay5@gmail.com)

**Khrystyna Kovalchuk**, PhD, Associate Professor, Department of Commodity Research and Commodity Expertise, Lviv Institute of Economics and Tourism, Lviv, Ukraine, ORCID: <http://orcid.org/0000-0001-6894-9392>, e-mail: [khristinakoalchuk1985@gmail.com](mailto:khristinakoalchuk1985@gmail.com)