

HEALTH SAFETY OF BAKERY PRODUCTS

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Abstract: Nutrition is the main factor in people's health. Food can be both a resource and a great hazard to the health of the entire population.

The Institute for Public Health Kragujevac is an accredited institution for food analysis. In 2023, 472 samples of bakery products were sampled and analyzed; 469 products (99.36%) were microbiologically safe and 460 products (97.45%) were chemically compliant. The increased yeast content was the microbiological reason for the unsoundness of the two bakery products.

Recommended measures: to increase the scope of testing in both microbiological and chemical aspects, by supplementing the current regulations.

Keywords: food, health safety, bakery product

Introduction

Nutrition is considered as the fundamental factor of human health, not only individually but also at the level of the entire population. Additionally, it is a basic human need and an essential prerequisite for maintaining life. From a historical perspective, food has had a particular purpose – serving as a means to satisfy people's hunger with a relatively steady proportion of specific nutritional component shares, i.e., food groups. Alterations in food-taking habits are associated with the development of human society, science, agriculture and industry, and the most dynamic ones were believed to have occurred in the 19th century, whereas one of the defining features of the 20th and 21st centuries is related to large migrations of populations of humans as well as demographic, epidemiological and nutritional transition. As regards the total morbidity and mortality rates, there has been a decrease in the participation of communicable diseases on one hand, whereas on the other there has been an increase in the participation of chronic non-communicable diseases (such as cardiovascular diseases, malignant disorders, etc.). A healthy and balanced diet is one of the most significant health resources for all the population categories. It is of particular significance for the youngest age groups at the moment when healthy lifestyles are being formed. It is extremely

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important to maintain adequate energy intake derived from food as well as to provide suitable energy intake for all age groups and both sexes.

Food and nutrition may be a health resource as well, but they may also pose a great health risk to the entire population's health. According to the definition, food consists of food group combinations, whether it is about processed, unprocessed or half-processed foods. Food is everything that enables a human organism to function normally – its life maintenance, growth and development. Each of the given foodstuffs is considered to be food, but not a single foodstuff cannot meet all the body's needs by itself – there is no such thing as a complete foodstuff. As regards its chemical composition, foodstuffs represent combinations of various nutrients, and according to the physiological definition – foodstuffs are mostly regarded as natural products of complex chemical composition, the purpose of which is to provide a normal life to an individual while being in adequate combinations with other food groups. According to the Law on Food Safety, foodstuff is defined as any processed or unprocessed substance used as food or drink complete with water and raw materials used for the production of foodstuffs, spices and additives.

Food of both plant and animal origin can be contaminated by a variety of microorganisms as well as by various chemical agents. Food health safety is determined exclusively using specific laboratory analyses being performed by adequate accredited methods. The examination parameters depend on the kinds of food and groups of foodstuffs and are defined by the national legal regulations – the Law on Food Safety and by a number of several sub-legal acts and Ordinances for each of the food categories separately. Some of the microbiological parameters are *Enterobacteriaceae*, *Salmonella* sp. *Escherichia coli*, a colony count of aerobic bacteria, molds and yeasts such as *Bacillus cereus*, *Listeria monocytogenes*, etc. A variety of chemical contamination can be detected: heavy metals, pesticides, additives, antibiotics, hormones, etc. whereas food may not be harmonized due to other examination parameters as well (degree of acidity, water content, dry matter content, fat content, filling content and likewise).

To control food health safety, food must be properly sampled and transported (in the proper manner) to the laboratory providing accredited microbiological testing and chemical analyses for foodstuffs.

The fundamental aim of this paper is the analysis of laboratory testing and evaluation of bakery products in the year of 2023.

Materials and methods

The research was administered as a retrospective cross-sectional study.

The documentation of the Centre for Hygiene and Human Ecology, Institute of Public Health Kragujevac, was used as the basis for this particular research. The Institute of Public Health Kragujevac, Centre for Hygiene and Human Ecology, is an accredited institution for food testing along with the testing of microbiological and chemical products as well.

The examined microbiological parameters of bakery products are shown in Table 1.

Table 1 – Microbiological parameters of bakery products

Parameter	Unit of measurement	Range	Examination method
<i>Enterobacteriaceae</i>	cfu/g	< 10	SRPS ISO 21528-2:2017
Molds and yeasts	cfu/g	< 10 ²	SRPS ISO 21527-2:2011

All of the microbiological analyses were performed using adequate examination methods by the currently valid legal regulations (the Ordinance on general and specific food hygiene requirements at any stage of production, processing and transportation, the Official Gazette of the Republic of Serbia, No. 72/2010, 62/2018).

The examined chemical parameters of bakery products are shown in Tables 2, 3 and 4.

Table 2 – Bakery products – yeasts

Parameter	Unit of measurement	Range	Examination method
Degree of acidity	%	-	Ordinance – Article II, paragraph 2
Water content	%	43 max.	Ordinance – Article II, paragraph 1
Dry matter content	%	-	Ordinance – Article II, paragraph 1

Table 3 – Yeast dough and pastry

Parameter	Unit of measurement	Range	Examination method
Water content	%	45 max.	Ordinance – Article II, paragraph 1
Dry matter content	%	-	Ordinance – Article II, paragraph 1
Sodium chloride content	%	-	In the chapter 5.88
Fat content	%	-	Ordinance – Article I, paragraph 15

Table 4 – The parameters used in the analysis of burek¹

Parameter	Unit of measurement	Range	Examination method
Water content	%	-	Ordinance – Article II, paragraph 1
Dry matter content	%	-	Ordinance – Article II, paragraph 1
Sodium chloride content	%	-	In the chapter 5.88
Fat content	%	-	Ordinance – Article I, paragraph 15
Filling content (considering the total product)	%	20 min.	-

¹ *Burek* is a type of baked or fried filled pie made of pastry and stuffed with cottage cheese or ground meat, *the author's comment*.

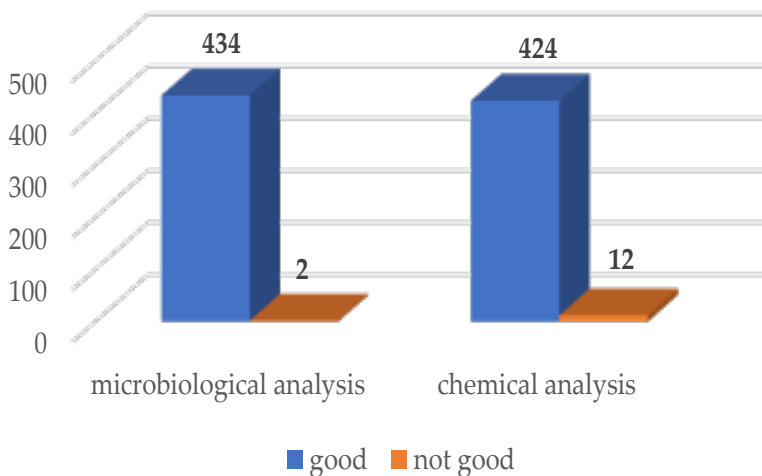
Apart from the above-mentioned parameters for each of the given bakery products, the following organoleptic properties were examined as well:

Appearance, aroma and flavor, the presence of other kinds of mixtures and a declaration (if there is one on the product).

All of the chemical analyses were performed by adequate examination methods by the currently valid legal regulations (the Ordinance on the quality of grain, mill and bakery products and pasta, the Official Gazette of the Republic of Serbia, No. 68/2016, and 56/2018).

Results and discussion

In the year 2023, the sampling and analyses of 436 samples of bakery products were carried out. The results indicated that the microbiological status of the surveyed bakery products was good with 434 (99.5%) samples, whereas the number of the ones produced following the chemical standards was 424 (97.2%). The cause of microbiological spoilage of two bakery products (two loaves of bread) was related to the increased content of yeasts, whereas the decreased filling content in the samples of burek (19.6%) was associated with them not being produced per the chemical standards.



Graph 1. The results of evaluation of bakery products

According to our national legal regulations, bakery products are defined as the ones produced using an adequate technological procedure and made from mill products, and water, with or without bakery yeasts or other ingredients used as leavening agents for raising dough, sodium chloride and other ingredients as well (the Ordinance on the quality of grain, mill and bakery products and pasta, the Official Gazette of the Republic of Serbia, No. 68/2016, 56/2018, Article 2, paragraph 9 – Articles 33-45 refer to the bakery products). Taking into consideration the classification of the bakery products defined in Article 1 of this Ordinance, which is established by their purpose, composition, characteristics and technological procedure, the above-mentioned products are launched into the market as nine groups of products, with bakery products occupying the sixth place. According to this Ordinance (Article 33), bakery products are classified into the following three groups: bread, pastry and other bakery products.

Bakery products are frequently and abundantly used in everyday nutrition of all population categories.

The following reasons may be considered: the availability of bakery products, prices, production methods, storage methods, a fast-paced lifestyle, etc.

These products may contain various kinds of grains with or without gluten, water, salt, sugar, additives, fats, yeasts and various fillings with or without meat and meat products.

Bakery products are not of great epidemiological significance, for they are prepared – baked in high temperatures, which is why the water content in the surface layer is low. Therefore, it does not provide favorable conditions for the growth of microorganisms. If the water content is increased or if the above-mentioned products are not being properly prepared or kept, the growth of yeasts, molds and even Enterobacteriaceae may be expected.

Regular analyses included in the requirements of the Ordinance do not examine the presence of heavy analyses and pesticides (grains are not treated by these means), mycotoxins (that can be found in contaminated grains), the content gluten and content of additives that are added during the production of bakery products. All of these additional products are relevant, so that the physicians could give their complete medical opinion on the health safety of the above-mentioned products.

Conclusion

The examined bakery products demonstrated a considerably high percentage of being by with the norms of national legal regulations and health safety.

The microbiological cause of the lack of health safety of the above-mentioned bakery products was related to an increased content of yeasts in bread, whereas in terms of determining its chemical content – it is associated with burek only and it refers to the decreased amount of filling when taking into consideration the total product which finally affects the overall quality of this particular product.

A proposal of potential measures entails the following: to increase the existing scope of examination in terms of performing further microbiological and chemical analyses, using introducing amendments to the currently valid Ordinances.

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