

DOI: <https://doi.org/10.53486/cike2022.02>

CZU: 664.69:613.2.03(478)

## RESEARCH ON THE DEVELOPMENT OF RECIPES FOR NOODLES FROM NON BREADABLE CHICKPEA FLOUR FOR PEOPLE WITH GLUTEN INTOLERANCE

**OLGA TABUNȘCIC**

Department Trade, Tourism and Public food  
Academy of Economic Studies of Moldova  
Kishineu, Republic of Moldova  
E-mail: [tabunscic.olga@ase.md](mailto:tabunscic.olga@ase.md)

**Valentina Calmăș**

Department Trade, Tourism and Public food  
Academy of Economic Studies of Moldova  
Kishineu, Republic of Moldova  
E-mail: [calmas.valentina@ase.md](mailto:calmas.valentina@ase.md)

**Svetlana Fedorciucova**

Department Trade, Tourism and Public food  
Academy of Economic Studies of Moldova  
Kishineu, Republic of Moldova  
E-mail: [fedorciucova.svetlana.constantin@ase.md](mailto:fedorciucova.svetlana.constantin@ase.md)

E-mail address of coresponding authors: [fedorciucova.svetlana.constantin@ase.md](mailto:fedorciucova.svetlana.constantin@ase.md),  
[tabunscic.olga@ase.md](mailto:tabunscic.olga@ase.md)

**Abstract:** *In the Republic of Moldova, currently, there is an increasing trend in the number of people suffering from celiac disease (CD), one of the most common chronic digestive ailments. The existence of people affected by this disease implies the presence of gluten-free products on the market. Bread, cereals, and floury pasta that are produced from wheat flour are prohibited in this diet they must be replaced with products made from non bread flours, obtained from cereals whose proteins do not generate gluten. The purpose of the work: the development of recipes for noodles from non bread chickpea flour for people with gluten intolerance. The research object - the technology of obtaining noodles from non bread chickpea flour and noodles from non bread chickpea flour with various additions, such as: flax seed flour; tomato paste; chopped spinach and addition of chopped beets. The research methods are: sensory, laboratory, technological and counting. Calculations are made regarding the energy value and the nutritional value index of the varieties of noodles made from non bread chickpea flour with various additions, as well as the cost price of these noodles. As a result of the scientific research carried out, it was proven that chickpea flour can be used in the technology of manufacturing gluten-free noodles. For implementation in production, the most suitable sort of noodles is the one made from chickpea flour without additives, which has superior physico-chemical, technological and organoleptic properties. We believe that the possibility of using chickpea flour for the manufacture of noodles can be very convenient for producers, for public alimentation units, thanks to the existence of the rich source of raw material, but also for consumers, because the flour obtained from chickpeas has an increased biological value.*

**Key words:** celiac disease, gluten-free products, noodles, chickpea flour

**JEL Classification:** L66, L81, M31, O32

## **Introduction**

In Republic of Moldova, as in other countries of the world, the number of people suffering from celiac disease, one of the most common chronic digestive disorders, is increasing. Epidemiological studies show that 15% of the world population suffers from celiac disease, with the number of cases being higher in Europe and lower in the USA and Asia.

According to the statistics of the Romanian Association for Gluten Intolerance, the number of people who follow a gluten-free diet on the advice of their doctor is estimated at 1 million in Romania [1]. In the Republic of Moldova, the first patients with celiac disease were diagnosed in 1998. Since then, more than 300 children with this disease and 37 patients with celiac disease with some degree of disability have been registered [7]. Some experts [3] believe that the real number of celiac disease patients in our country is unknown, because the diagnosis is difficult due to the wide range of symptoms and the only treatment is a strict diet avoiding the consumption of gluten-containing products.

Gluten sensitivity is a disorder in which the body cannot tolerate gluten, a protein found in grains such as wheat, barley, and rye. Experts believe that this is not life-threatening, although it can cause discomfort and affect daily life.

For the first time in the Republic of Moldova, a unique registry for celiac disease patients has been created to ensure centralized registration of patients with this disease [7]. People in our country diagnosed with celiac disease face problems such as a limited range of local gluten-free foods sold in stores, but also the lack of public food facilities where gluten-free dishes can be consumed. Thus, each patient is often forced to buy imported gluten-free products, which are expensive compared to the income of the population, and prepare their own food.

This article analyzes the range of gluten-free products from the Republic of Moldova and presents new technologies for the production of noodles from gluten-free chickpea flour, whose sensory, physicochemical and technological characteristics are acceptable and accessible to all social groups of people with gluten intolerance.

## **Research methods used**

Carrying out the research in question, the following methods were used: observational, experimental, organoleptic (scoring) and calculation.

So, for the analysis of information on the range of gluten-free products sold in grocery stores on the territory of Moldova, the observational method was used. Information was collected on the types of gluten-free products by manufacturer categories. The research was conducted in the period from March 2021 to September 2022.

The experimental method was used to develop new technologies for the production of noodles from gluten-free flour with various additives.

For the analysis of organoleptic indicators (appearance, color, consistency, taste, smell) of the noodles assortments produced in the laboratory, a rating scale from 0 - 5 points was applied; and the technological characteristics, such as cooking time, increase in the volume of pasta, were determined by experimental laboratory methods.

The energy value and nutritional indicators were determined by the calculation method.

## **Results and discussions**

In the Republic of Moldova, there is no organized environment for celiac patients, there are no grocery stores that would have gluten-free dishes on the menu, and the menus in schools and kindergartens do not include gluten-free dishes, so each patient is forced to prepare their own food or order imported products online, the quality of which they cannot be sure, but which cost less than the imported products sold in stores in the country. There are few local manufacturers in the field of milling and baking, such as BioEM SRL, whose main product is sorrel. The company offers sorrel flour and hemp seeds, both gluten-free; Art-ProEco SRL, brand "Ronți" - cereal flakes, including gluten-free flakes. According to the sources [5, 6], the list of manufacturers from Moldova and stores offering gluten-free products is as follows:

- Artisanal bakery [Natka Minunatka](#) - gluten-free bread;
- The Kaufland and Nr. 1 the BIO shelf German gluten-free bread, biscuits and other dishes from this category
- [Pure tastes - desserts without gluten and sugar](#) bread and buckwheat
- George Standart - an online store with bakery products, including gluten-free;
- [Gluten-free sorghum products](#). [6].

Although in recent years some producers of gluten-free products have appeared on the local market. Their assortment is very limited, especially some types of flour, bread and cookies, and there are no gluten-free pasta, they are only imported.

Moldova is a country where the cultivation of wheat and the production of bread is a traditional custom. The traditional flour pasta is homemade noodles used in various traditional dishes such as "zeama", "baba alba", noodles with cheese, noodle pudding, etc. These noodle dishes are traditionally made only from wheat flour, which limits the consumption of these traditional dishes for people with gluten intolerance.

Analyzing the offer of noodles sold in grocery stores on the territory of Moldova, we note that about 7 types of gluten-free pasta made of white and brown rice, buckwheat, corn, hemp, sorghum and millet are offered for sale, imported from Ukraine by the manufacturer Ms. Tailly. The Kaufland store produces 3 types of corn pasta with the addition of 2% chickpea flour (spaghetti, penne, fusilli) under the K-free brand. From the Italian manufacturer "Di Nunzio" you can find three types of gluten-free pasta - beans, lentils and green peas.

Based on the above, we set out to develop new recipes and technologies for gluten-free noodles made from non-baking chickpea flour with various additives. It is well known that the dough made from non-bakeable flour is very difficult to stretch. To prevent sticking and deformation, a large amount of flour is needed during stretching. To reduce the preparation time and consumption of flour for stretching and cutting, KINGH off 3113 pasta machine was used. Chickpea flour from the manufacturer Ms. Tailly from Ukraine was used for the investigation.

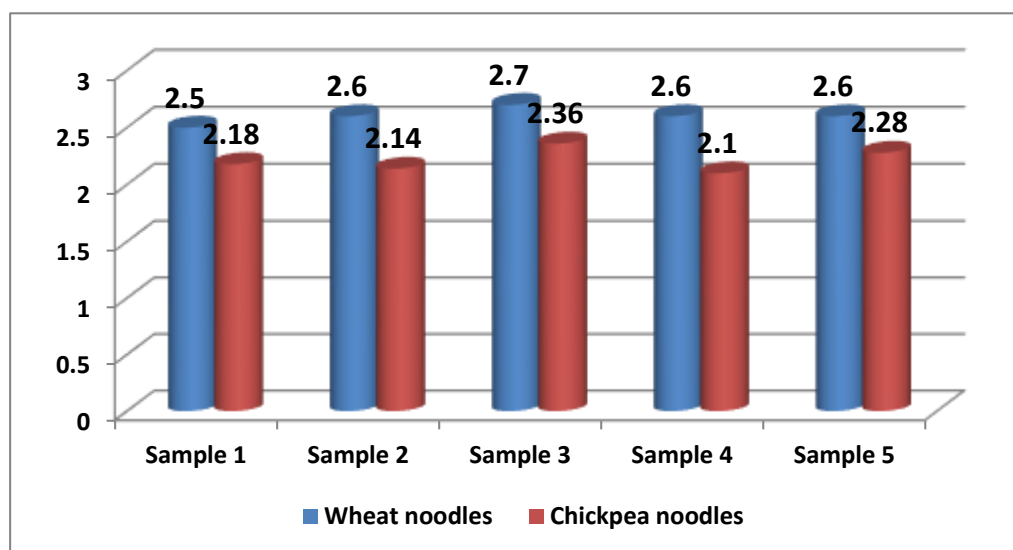
Before the study, tests were conducted in order to determine the optimal ratio between the raw materials used, and the recipe for 100 g of dough was developed, which is shown in the table below (nr. 1).

**Table 1 Sample recipe for 100 g of chickpea flour dough**

No. Sample	Name	Flour (%)	Eggs (%)	Salt (%)	Addition (%)
1	chickpea flour noodles	61	35	4	-
2	- with the addition of flour from flax seeds	51	35	4	10
3	- with the addition of tomato paste	61	25	4	10
4	- with the addition of chopped spinach	61	25	4	10
5	- with the addition of chopped beets	61	25	4	10

**Source:** elaborated by the authors

Compared to noodles made with wheat flour, fewer eggs and more flour are used. During the stretching of the dough, no sample showed deformations. The obtained samples were cooked for 7 minutes to obtain noodles with soft consistency, and for noodles with "al dente" consistency, the cooking time was 5 minutes. The increase in volume of noodles made from chickpea flour after cooking compared to noodles made from wheat flour is shown in Figure 1.



**Figure 1. Increase in volume of chickpea and wheat noodles ( n times)**

**Source:** elaborated by the authors

Following the experiment it was found that during cooking, the noodles did not deform, and foam formed on the surface during the first 4 minutes of cooking. This can be explained by the fact that chickpea is a legume that contains an increased amount of protein, which coagulates and forms foam during cooking.

Samples 1, 2 and 4 increased in volume by 2.1 times, sample 3 - by 2.36 times and sample 5 - by 2.28 times after cooking. Noodles made from chickpea flour showed 15% less volume

increase compared to those made from wheat flour. The results of the psycho-sensory analysis are shown in Table 2.

**Table 2 Organoleptic indices of chickpea flour noodles**

Sample No.	Consistency	Appearance	Color	Smell	Taste
1	Soft	Wavy shape, without deformations	Uniform, golden yellow	Specific to flour, without foreign smell	Salty with pronounced taste of chickpeas
2	Soft with a tendency to agglomerate when chewing Clumped	With small brown particles	Brown	Specific to flour, no foreign smell	Moderately salty, slightly pronounced chickpea
3	Soft, sticky	Well - preserved shape	Orange	Specific to flour, weak pronounced tomato	Moderately salty, with a slight taste of tomato
4	Soft, sticky	Well - preserved shape, with small pieces of spinach	Weak - greenish	Flour - specific, slightly pronounced spinach	Moderately salty, with a slight chickpea taste
5	Soft, sticky	Well - preserved shape	Uneven light pink	Specific to flour, faintly pronounced beet	Moderately salty, with slightly pronounced beet taste

**Source:** elaborated by the authors

A scoring scale of 0-5 points was used to evaluate the organoleptic indices. Sensory analysis of the resulting samples was evaluated by 5 people who analyzed the appearance, consistency, color, odor, and taste of the chickpea flour noodles. The data obtained are presented in Table 3.

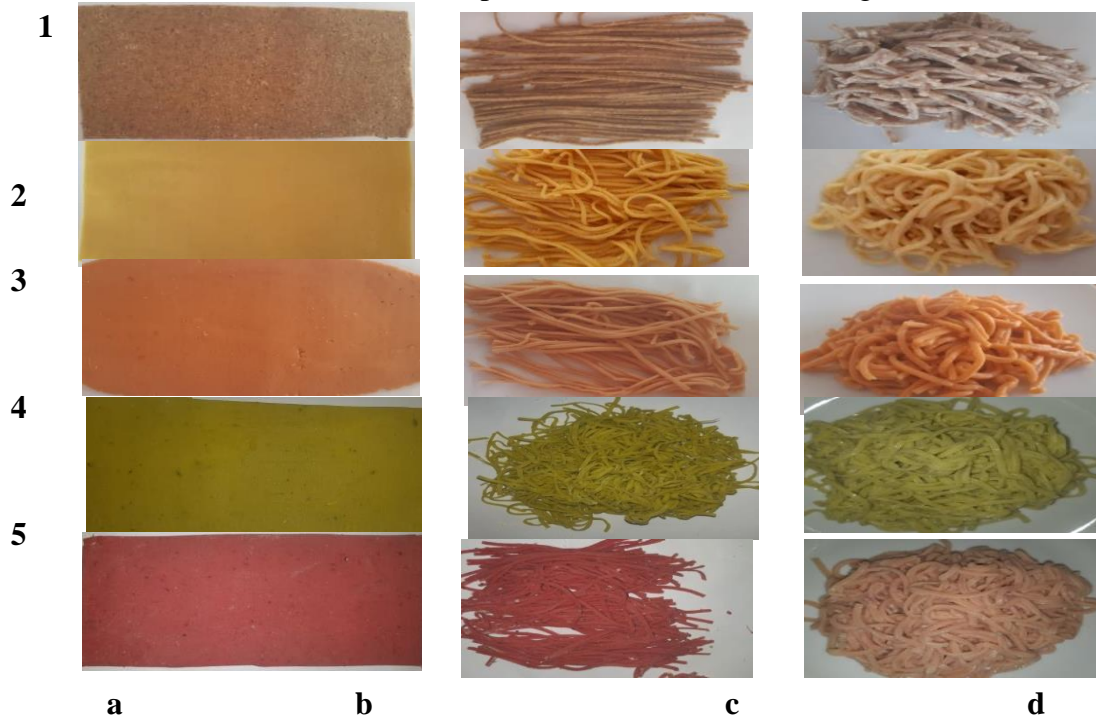
**Table 3 Sensory analysis with scoring scale of chickpea flour samples**

No. Sample	Average number of points awarded					Total score
	Appearance and shape	Consistency	Color	Smell	Taste	
1	5	5	5	5	5	5
2	2	1	1	2	2	1.6
3	3.4	3	4	4	3.4	3.56
4	4	4	3.4	4	4	3.88
5	3.4	3	1	3	3.4	2.76

**Source:** elaborated by the authors

According to the sensory analysis, samples 2, 3, 4 and 5 were evaluated negatively because they had an inappropriate appearance and color after cooking and all these products were not suitable for consumption. Sample 1 (noodles made from chickpea flour without additives) obtained the maximum score and can be accepted for consumption.

Pictures of noodles made from chickpea flour can be seen in the figure 2, below.

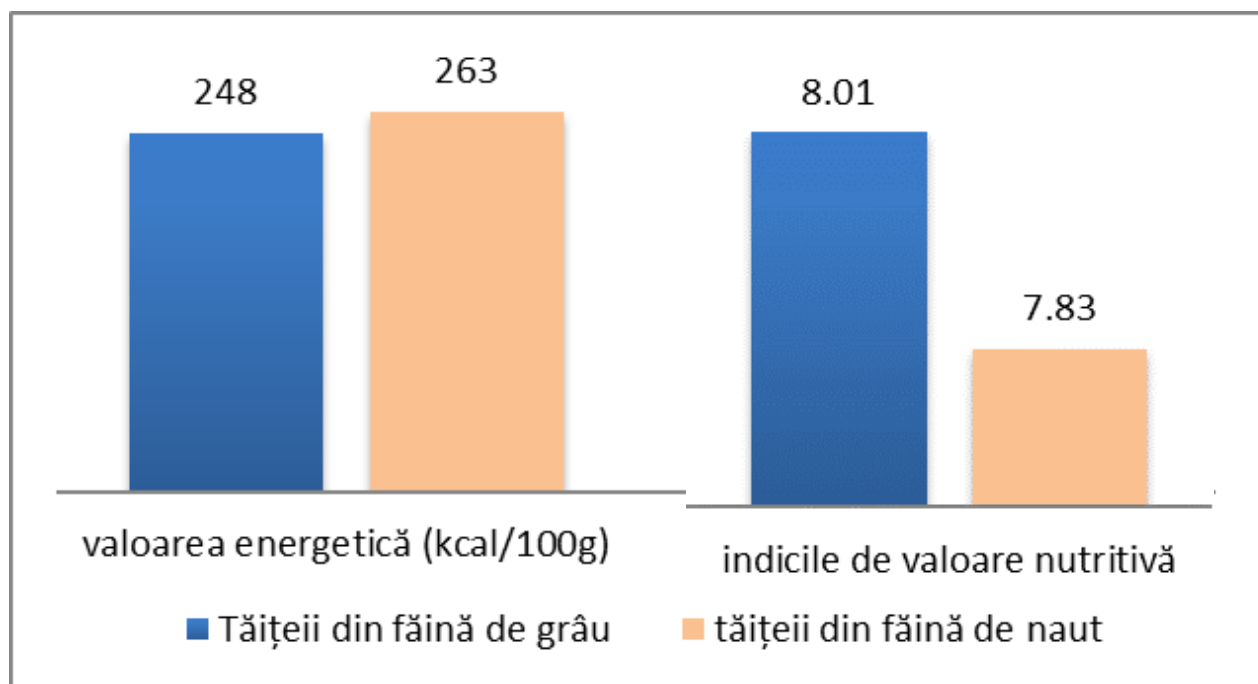


**Figure 2. Images of chickpea flour noodles before and after boiling**

**a**-sample number; **b**- stretched dough; **c**- noodles before boiling; **d**-the noodles after boiling.

**Source:** elaborated by the authors

The noodles with the addition of spinach showed a weak color and a tendency to agglomerate when chewed, and the noodles with the addition of beets lost their color after cooking and showed white spots on the surface. The noodles with the addition of tomato paste exhibited a sticky texture and an inappropriate taste after cooking. The energy and nutritional value of the chickpea flour noodles is shown in Figure 3.



**Figure 3. Energy and nutritional value of chickpea and wheat noodles**

Source: elaborated by the authors

### Conclusions

1. The market of gluten-free products on the territory of Moldova is mainly characterized by imported products (from Ukraine, Poland, Italy and Romania) with an assortment of gluten-free pasta (from hemp, rice, chickpeas, peas, beans, rye, corn, buckwheat, lentils, pumpkin seeds) and with an assortment of about 20 types of gluten-free flours.

2. The technological process for the production of gluten-free noodles is not described in any regulated recipe book. For this reason, the technological process for the production of noodles from gluten-free flours was developed on the basis of the classic noodles recipe, or the determination of quality indices was carried out on the basis of the methods provided for noodles from wheat flour.

3. Sample 1 *without additive* (noodles made from chickpea flour) is recommended for consumption and preparation, which has the following characteristics compared to noodles made from wheat flour:

- a 13% shorter cooking time (7 minutes);
- a 15% smaller volume after cooking;
- a 6% higher energy value (263 kcal/100 g);
- and the nutritional index is 2% lower (VN10=7.83).

The additions of spinach, flaxseed meal, tomato paste and beet are not suitable for this type of flour, as they do not meet the psycho-sensory quality characteristics after cooking, such as uneven color, unpleasant taste, sticky consistency and have a tendency to agglomerate when chewed.

## REFERENCES

1. Bureau veritas auditeaza cristim pentru certificarea gluten free octombrie, 2019 [accessed March 18, 2021]. Available: [www.bureauveritas.ro/newsroom/bureau-veritas-auditeaza-cristim-pentru-certificarea-gluten-free](http://www.bureauveritas.ro/newsroom/bureau-veritas-auditeaza-cristim-pentru-certificarea-gluten-free).
2. Produse fără gluten sunt sănătoase sau nu?, 2019, [accessed March 18, 2020]. Available: [www.dozadesanatate.ro/produsele-fara-gluten-sunt-sanatoase-sau-nu/](http://www.dozadesanatate.ro/produsele-fara-gluten-sunt-sanatoase-sau-nu/).
3. Le plătesc pensie pentru invaliditate și cu asta s-au spălat pe mâini. Bolnavii de celiachie se plâng că autoritățile din Moldova nu fac nimic pentru a le ușura viața [accessed March 18, 2020]. Available: [www.e-sanatate.md/News/2173/le-platesc-pensie-pentru-invaliditate-si-cu-asta-s-au-spalat-pe-maini-bolnavii-de-celiachie-se-plang-ca-autoritatile-din-moldova-nu-fac-nimic-pentru-a-le-usura-viata](http://www.e-sanatate.md/News/2173/le-platesc-pensie-pentru-invaliditate-si-cu-asta-s-au-spalat-pe-maini-bolnavii-de-celiachie-se-plang-ca-autoritatile-din-moldova-nu-fac-nimic-pentru-a-le-usura-viata).
4. Produse speciale pentru intoleranțe alimentare [document] 2019, [accessed March 20, 2021]. Available: [www.academia.edu/20261203/Produse\\_speciale\\_pentru\\_intolerante\\_alimentare](http://www.academia.edu/20261203/Produse_speciale_pentru_intolerante_alimentare).
5. <https://ea.md/lista-producatorilor-de-la-noi-care-au-produse-fara-gluten-faina-deserturi-si-paine/>.
6. [https://www.facebook.com/FaraGlutenFabricatInMoldova/?ref=gs&eid=ARBeEAWaUGJv7HjM2hY6BxnEYyg3\\_pm0BoRIGHgcXqrTJpmV1rEAkOeHZXKddrxr0yz4E117FwK8-yEK&fref=gs&dti=2026571547488514&hc\\_location=group](https://www.facebook.com/FaraGlutenFabricatInMoldova/?ref=gs&eid=ARBeEAWaUGJv7HjM2hY6BxnEYyg3_pm0BoRIGHgcXqrTJpmV1rEAkOeHZXKddrxr0yz4E117FwK8-yEK&fref=gs&dti=2026571547488514&hc_location=group).
7. Registrul de evidenta al pacientilor cu intoleranta la gluten, [accessed July 20, 2022]. Available: <https://usmf.md/ro/noutati/premiera-registrul-de-evidenta-al-pacientilor-cu-intoleranta-la-gluten>