

Sensory and physicochemical characterization of bread with turmeric and nettle, linseed and chia

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Abstract

The aim of the paper is to create an authentic product - bread nutritionally enriched with turmeric (curcuma) and nettle, linseed and chia and to characterize it from a sensory and physicochemical point of view. The integration of ingredients such as turmeric, nettle, flax seeds and chia into traditional bread recipes bring significant benefits, with an important role in increasing the final nutritional value of the bread. Without the addition of preservatives or other chemical additives, the "bread with turmeric and nettle, linseed and chia" was obtained bread with health benefits, because nettle is rich in essential vitamins and minerals, such as iron and calcium, the seeds flaxseeds are an excellent source of omega-3 fatty acids and fiber, chia seeds contain considerable fiber, protein and antioxidants, and turmeric is known for its anti-inflammatory and antioxidant properties and helps strengthen the immune system. The sensory quality of the bread samples was evaluated 24 hours after manufacture. The external appearance, the appearance in the section, the consistency, the color, the smell and the taste of the bread were evaluated sensory, it being highly appreciated from the point of view of taste, color and consistency. Regarding the physico-chemical analyzes carried out (moisture, acidity, porosity, salt content) as conclusive data we can appreciate that all the values obtained for the analyzed bread samples fall within the standard values.

Key words: bread, seeds, curcuma, nettle, functional food.

1. Introduction

Bread is by far a fundamental food for nutrition. Today, bread consumers are divided into two large categories: those who prefer classic, traditional bread, and those who opt for bread with special ingredients, rich in nutrients and health benefits [21]. Making bread with turmeric, nettle, flaxseed and chia reflects an emerging trend in the food industry that emphasizes health, sustainability and diversifying product offerings for nutrition-conscious consumers. Special ingredients: turmeric, nettle, flaxseed and chia seeds play an important role in increasing the nutritional value of bread [1,5,8]. Turmeric (*Curcuma longa*) is a perennial plant of the ginger family, used for centuries in cooking [2]. Curcumin, the main active compound in turmeric, is

known for its powerful anti-inflammatory and antioxidant properties [3,4]. Studies suggest that turmeric may help prevent and manage conditions such as arthritis, cardiovascular disease and certain types of cancer [18,19,20]. In bread, turmeric not only imparts a distinctive golden color, but also a slightly spicy flavor, bringing health benefits [21]. Nettle (*Urtica dioica*) is a perennial herbaceous plant, valued for its rich content of vitamins (A, C, K, and some B vitamins), minerals (iron, calcium, magnesium), and antioxidants [5,6]. The leaves are rich in many bioactive compounds, such as flavonoids, phenolic acids, and amino acids. Nettle has diuretic, anti-inflammatory, and detoxifying properties, and has been traditionally used to treat various conditions, from allergies to anemia. Incorporated into

bread, nettle adds a pleasant texture and subtle flavor, while enriching the nutritional profile of the final product [6]. Flaxseeds (*Linum usitatissimum*) are known for their high content of omega-3 fatty acids, fiber, and lignans, which have antioxidant and cholesterol-lowering properties [9, 10]. Regular consumption of flaxseeds may improve cardiovascular health, digestion, and help regulate blood sugar levels. In bread, flaxseeds add a slightly crunchy texture and nutty flavor, while also contributing to better satiety and digestion [7,8,11]. Chia seeds (*Salvia hispanica*) are rich in fiber, protein, omega-3 fatty acids, and antioxidants [12,14]. *Salvia hispanica* seeds are also a particularly rich source of Ca (560–800 mg/100 g dry seeds) and Mg (325–460 mg/100 g dry seeds) [12,17]. *Salvia hispanica* seeds contain vitamins B, C, A and E [12,13]. They help maintain hydration, stabilize blood sugar levels and improve digestive health [15,16]. Chia seeds are capable of absorbing up to 12 times their weight in water, forming a gel that can improve the texture of bread, making it fluffier and more moist.

2. Material and methods

To prepare the bread with turmeric and nettle, flax seeds and chia, we started from the classic recipe for homemade bread with flour, water, yeast and salt, to which the following ingredients were added to the dough: turmeric powder, finely ground dried nettle and sieved to remove coarse vegetable debris, flax seeds and chia. We used white wheat flour type 550, fresh yeast and non-iodized salt. After activating the yeast, all the ingredients were added to the flour and then the dough was kneaded until it became elastic and homogeneous, the dough was left to rise for approximately 1-2 hours, it doubled in volume, after which the dough was shaped, notched and baked in the preheated oven at 220°C, for 30-35 minutes, until the crust of the bread became golden brown, and when tapped on the back of the bread, it sounded hollow. After the breads were prepared, they were analyzed sensory and physicochemically. Thus, 2 types of bread

obtained (with turmeric, nettle, flax seeds and chia and bread with turmeric and nettle) were evaluated by 10 evaluators, aged between 16 and 55 years, without food allergies. The samples were presented once to each evaluator in coded plastic plates. The following sensory attributes were evaluated: appearance, color, consistency, smell and taste, using the 5-point hedonic scale: 5 – extremely pleasant, 4 – moderately pleasant, 3 – indifferent (neither pleasant nor unpleasant), 2 – slightly unpleasant, 1 – extremely unpleasant. Regarding the physicochemical analyses, the following characteristics were determined: humidity, acidity, porosity and NaCl content. Humidity was determined by the oven drying method, acidity by titration with 0.1 n NaOH, NaCl content was determined by the Mohr method, and porosity by the weighing method (STAS 91/83).

3. Results and Discussion

The results of the sensory examination obtained from the analysis of the questionnaires for the 2 bread varieties are presented below. The most appreciated sensory characteristics were the taste and the color (with very close average scores of 4,6 points and 4,5 points respectively), but also the consistency (with an average score of 4,3 points).

The appearance and smell had a lower score than the other listed characteristics, with an average value of 4,1 points for appearance and an average score of 3,9 points for smell, respectively.

In sensory evaluations presented by other researchers, bread with the addition of turmeric and nettle powder up to 2% had the highest acceptability score. However, the authors recommend adding turmeric and nettle powder up to 4% due to the higher nutritional value of the product obtained and the health benefits that this type of bread brings [22]. On the other hand, the incorporation of turmeric powder significantly increased curcumin, so it can be effectively incorporated into the bread to provide functional components and higher antioxidant properties [23].

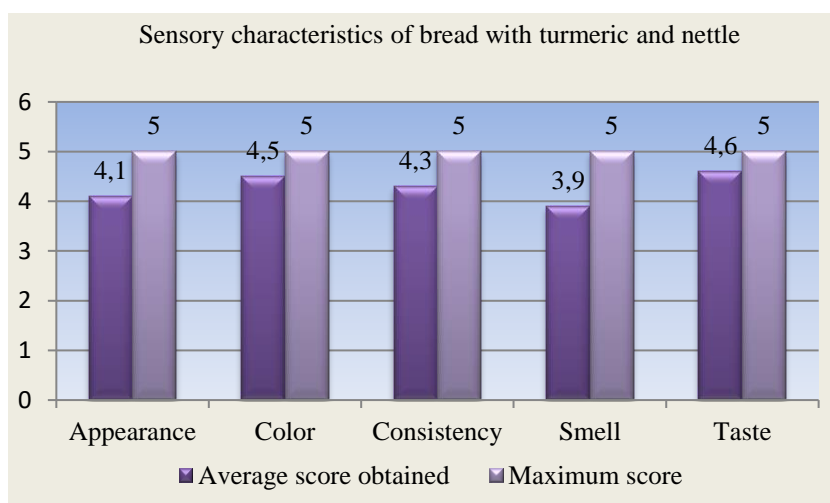


Figure 1. Graphic representation of sensory analysis of bread with turmeric and nettle

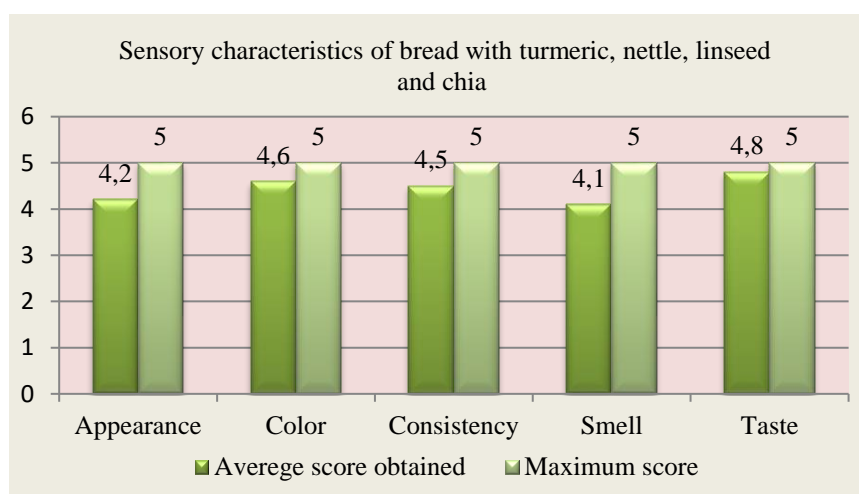


Figure 2. Graphic representation of sensory analysis of bread with turmeric, nettle, linseed and chia

In the case of the turmeric and nettle, flaxseed and chia bread, the most appreciated characteristic was the taste (average score being 4.8 points), followed by the color (average score being 4.4 points) and the consistency (average score being 4.6 points). The appearance and smell were less appreciated, so the appearance accumulated an average score of 4.2 points, and the smell was appreciated at an average score of 4.1 points. An important finding of the researchers is that the value of adding oilseeds to bread depends

on the form in which it is applied to the product. Ground chia seeds, compared to whole seeds, increased some nutritional values (fiber, polyphenol content) of the finished product to a greater extent, also flax seeds have the potential to improve the nutritional quality of bread without negatively affecting the quality of the diet [24,25].

The results of the physicochemical examination of the bread with turmeric and nettle, and of the bread with turmeric and nettle, flax seeds and chia are presented numerically below.

Table 1. Average values of physico-chemical characteristics of bread varieties

Bread assortments	Humidity (%)	Acidity (°T)	Porosity (%)	NaCl %
Bread with turmeric and nettle	41,8±0,05	2,70±0,36	77,63±2,48	1,05±0,07
Bread with turmeric and nettle, linseed and chia	42,47±0,35	2,46±0,40	78,94±2,04	1,06±0,11

4. Conclusion

Two bread varieties were obtained (turmeric and nettle bread and turmeric, nettle, flaxseed and chia bread), which were subsequently analyzed sensory and physicochemically. Of the two bread varieties analyzed, the most appreciated variety from a sensory point of view was turmeric, nettle, flaxseed and chia bread. The most appreciated characteristics of turmeric and nettle bread were taste and color, with an average score of 4,6 points and 4,5 points, respectively, followed by consistency with an average score of 4,3 points. The least appreciated was the appearance with an average score of 4,1 points and the smell with an average score of 3,9 points. The most appreciated characteristics of the bread with turmeric and nettle, flax seeds and chia were the taste and color with an average score of 4,8 points, respectively the color with an average score of 4,6 points, but also the consistency with a score of 4,5 points. Appearance and smell scored lower than 4,2 and 4,1 points, respectively. Analyzing the results obtained from the physicochemical determinations carried out (humidity, acidity, porosity and NaCl content) for the 2 bread varieties, higher values were obtained in the case of the bread with turmeric and nettle, flax seeds and chia for humidity 42,47%, porosity 78,94% and NaCl content 1.06%, the acidity having a slightly lower value of 2,46 °T, compared to the bread with turmeric and nettle which recorded humidity values of 41.79%, porosity 77,63%, 1.05% NaCl, and the acidity having a value of 2,7°T. All the values obtained fall within the permitted limits for this product variety.

Bread with turmeric and nettle, linseed and chia is a nutritious and healthy bread, rich in vitamins, minerals, omega-3 fatty acids and antioxidants. This combination of ingredients transforms traditional bread into a health-promoting superfood.

In an industry dominated by standardized products, the introduction of unconventional ingredients is an act of innovation. Making turmeric, nettle, flaxseed and chia bread meets modern nutritional requirements and enriches the olfactory palette of bakery products.

Conflict of interest. The authors declare that there are no competing interests.

Compliance with ethical requirements. The authors declare that they comply with the ethical

requirements of the journal. The authors declare that they have no conflict of interest and all procedures involving human and/or animal subjects (if any) comply with specific regulations and standards.

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