

Sensor analysis of functional biscuits

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Abstract

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Introduction. The biscuits are important bakery products which are favorable due to lower production costs, convenience and long shelf life. Usually are consumed as a dessert or as a light snack between meals. The classic biscuits have functional properties, so it is necessary to change the composition recipe by adding different functional components. In that context by adding inulin and acacia gum the obtained biscuits are with functional features and then they are sensory assessed.

Materials and Methods. This paper is made as sensory evaluation of three types of functional biscuits "Fructi"; "Fructi + Inulin" and "Fructi + Fibregum". The biscuits were assessed by 46 evaluators from R. Macedonia and Bulgaria. Biscuits evaluators assessed according to the following sensory attributes: appearance, structure and breaking, smell, taste and chewable.

Results and discussion. It is necessary to know the sensory characteristics of an appropriate product because they determine its quality. From the conducted sensory evaluation of three types of functional biscuits is determined that the with the highest scores in terms of appearance are assessed biscuits "Fructi + Fibregum" (3.45). The same biscuits with highest proportions of points are assessed in terms of the structure and breaking, as well as in terms of smell and taste. In terms of chewing biscuits "Fructi" are rated with a higher number of points (19.3) compared to biscuits "Fructi + Inulin" and "Fructi + Fibregum". With highest total average sensory evaluation are assessed biscuits "Fructi + Fibregum" (16.42).

Conclusion. From the conducted sensory analysis can be concluded that the biscuits "Fructi + Fibregum" are featured with the best sensory characteristics.

Introduction

On the road to optimal nutrition which presents ambitious long-term goal, "functional food" look new, interesting concept. This concept should be built on solid scientific foundations, while being accepted by consumers [1].

In accordance with FUFOSSE functional food is characterized by the following features: conventional or daily food or supplements; natural components present in food; a proven beneficial effect on certain functions outside the nutritional value of the product; possess conclusive scientific studies proving the enhanced well-being and health and / or reducing the risk of disease and / or improve the quality of life including physiological and psychological improvement [2].

In a broad concept of functional food Mishan [1] lists the: natural nutrition rich food, food that is enriched with functional ingredients, food which excludes certain ingredients, food in which are changed the properties of certain components, food in which the bioavailability of one or more components has been modified and all combinations of these possibilities.

Biscuits are type of cookies with a grain base and containing a large quantity of sugars and fat levels [3]. The composition of biscuits includes a number of raw materials, different enhancers and other accessories, so they differ in appearance, composition, mass, consistency, structure and production technology [4]. There are possibilities for the production of dietetic biscuits with sugar replacement, using fats with different characteristics, as well as enrichment of biscuits with different functional components [5].

Dietary fiber have many characteristics which include them as an important ingredient in the recipes for production of functional foods [6,7].

Inulin is used in food industry to increase the proportion of dietary fiber in the final product. Advantage over "traditional" dietary fiber is that inulin does not possess a distinctive raw taste and does not contribute to increased viscosity of the final product, so its usage results in products enriched with dietary fibers that retain the organoleptic properties of the standard recipe composition [8].

Acacia gum is used in food industry for decades as an additive to diet. When used as a food, the acacia gum has a role as an improver, thickener, stabilizer, emulsifier, and coating agent. Such different functions of a product makes it unique [9].

The sensor quality (shape, color, smell, taste, texture) is of great importance for all food products. It is a feature that every customer everyday evaluates and based on that assessment makes the decision whether that product will be bought [10].

Since biscuits belong to the group of confectionery which are characterized by attractive appearance, pleasant taste and aroma it is very important to analyze their sensory characteristics.

In this paper we examined the sensor characteristics of three types of functional and fortified biscuits and is determined their sensory quality.

Materials and methods

In this paper was made a sensor analysis of three kinds of functional biscuits ("Fructi", "Fructi + Inulin" and "Fructi + Fibregum"). Biscuits "Fructi" are the basic type of functional biscuits, while biscuits "Fructi + Inulin" are with added inulin to the basic recipe composition, and biscuits "Fructi + Fibregum" are with added Fibregum (Acacia gum), whereby the biscuits "Fructi" further are enriched with fiber.

The biscuits are made in a confectioner's shop "Sweet Pleasures" in Veles, Republic Macedonia in accordance with HACCP standards.

The produced biscuits were evaluated using the scoring method [10] by 46 assessors. All sensor properties are clearly defined and described in the form of sensor evaluation of biscuit cookie (Table 1).

Table 1

Application form for sensor evaluation of biscuit cookie [4]

Quality Factor	O	FZ	Evaluation	Requirement of quality
Appearance (size and shape)	5	0,8		Adequate characteristic (circular) shape, without damage to upper and lower surface.
	4			Very slight deviation from the circular shape.
	3			Deviation of the shape, size.
	2			Great deviation from the shape and size.
	1			Deformed, a large deviation of the biscuit cake.
Structure and snapping	5	0,8		Soft, uniform fine structure.
	4			Very small deviation of porosity.
	3			The biscuit cake is dry, slightly crumbling.
	2			The biscuit cake is expressed dry.
	1			The biscuit cake is very dry.
Chewing	5	0,8		The biscuit cake is soft, evenly softens in the mouth.
	4			Very little deviation from the optimal.
	3			The biscuit cake is dry, hard with a sharp taste.
	2			There is rather atypical chewing.
	1			Expressed rather atypical chewing.
Scent	5	0,6		Characteristic, slightly sensitive, aromatic. Constant for specific time period.
	4			Characteristic, less pronounced aromatic.
	3			Slight odor, low aromatic.
	2			Slight odor.
	1			Atypical strange smell.
Flavor	5	1,0		Characteristic, slightly sensitive, aromatic. Constant for specific time period.
	4			Pleasant permanent taste.
	3			Moderate pleasant taste.
	2			Slight pronounced taste.
	1			Atypical strange taste.

The individual parameters are corrected with FZ (correction factor), by which have been obtained points (PB), whose assembly is obtained to total number of points for sensor quality of the product. Depending on the sum of points is determined in which category the product belongs to by sensor quality (Table 2).

Table 2

Category of sensor quality depending on the sum of gained points (PB)

Quality category	Sum (PB)
Excellent	19.1-20.0
Very good	16.1-19.0
Good	13.1-16.0
Frail	11.1-13
Not match	<11.1

Results and discussion

Sensor or organoleptic properties of food, as an aspect of quality, are associated with a sense of comfort that food can provide when consuming, and include those attributes that can be perceived with the senses of sight, smell, taste, touch, and even with hearing. Sensor properties are the first and often the only parameters on which the majority of consumers assess the quality of food [11]. The results of the sensor analysis are given in (Table 3).

Table 3

Results of sensor analysis of functional biscuits

Quality Factor Type of biscuits	Appearance	Structure and snapping	Scent	Chewing	Flavor	Total PB
“Fructi”	3.43	2.98	2.44	3.19	3.59	15.63
“Fructi+Inulin”	3.41	2.98	2.34	3.09	3.71	15.53
“Fructi+Fibregum”	3.45	3.28	2.62	3.01	4.06	16.42

* The values in this table are calculated according to the average values from the results of the evaluators.

Appearance. The appearance or optical property is based on the sense of sight, and it includes the capacity that can be visually examined. Every merchant knows that the appearance is often the sole purpose of which is based the decision whether something is to be bought and eaten or not. About the size and shape are important: the length, thickness, width, size of particles, the geometric shape (square, circular, etc.) [12].

The color affects the appearance, as well. Color is important because it is used as a control parameter during baking of biscuits [13]. Many factors influence the formation of the final texture of products, including temperature, air speed, humidity and heat transfer in the sample [14].

From Table 3 can be concluded that in terms of appearance with the highest score were assessed biscuits "Fructi + Fibregum" (3.45), and the least biscuits "Fructi + Inulin" (3.41). Biscuits "Fructio" are evaluated with 3.43 points.

The external appearance of biscuits with a different recipe composition is evaluated by Yadav et al. [15] who examined the effect of partly skimmed peanut flour on nutritional, organoleptic and physico-chemical characteristics of biscuits. Best assessed in terms of external appearance were biscuits which recipe composition contained 0% partly skimmed peanut flour.

Structure and snapping. Based on the results obtained from sensor analysis of biscuits (Table 3) is determined that the biscuits "Fructi" and "Fructi + Inulin" are characterized by the same number of points, regarding the structure and snapping (2.98 points). With a higher number of points (3.28) compared to the same parameter, are featured biscuits "Fructi + Fibregum".

Yenkar et al. [13], who made sensor analysis of biscuits made of Rajgira and Sabudana (local types of flours that are rich in vitamins and minerals) in a different ratio, found that in terms of structure best are biscuits made of flour Rajgira and Sabudana in the ratio 3: 2.

Best rated biscuits are from skim peanut flour in terms of structure which in their biscuit recipe have composition of 5% of partly skimmed peanut flour [15].

Jothi et al. [16] did tests on crackers (a type of biscuits) made with various flours (potato flour, rice flour without gluten, a type of Italian mix of flours ...) in a different ratio, using as a control sample, in which they took biscuits from wheat flour. Regarding the structure, the best rated were the control types of cookies (biscuits made of white wheat flour).

In contrast of this, during sensor analysis of biscuits made in a different proportion of white wheat flour and skim sesame flour, the best structure according to the evaluators had biscuits made from 80% white wheat flour and 20% skimmed flour sesame, while the worst biscuits were made only of white wheat flour (control) [17].

Govindaraj et al. [18] made surveys of biscuits fortified with FeSO_4 and NaFeEDTA and varying amounts of tartaric and citric acid. Between biscuits fortified with FeSO_4 and different amounts of tartaric acid (60, 80 and 10 mg) and between biscuits fortified with FeSO_4 and different amounts of citric acid (60, 80 and 10 mg), structure is best evaluated in the control sample in which nothing is added. Also, during fortification of biscuits with NaFeEDTA and adding a predetermined quantity of tartaric acid (60, 80 and 10 mg) and fortification of biscuits with NaFeEDTA and different amounts of citric acid, the control sample of biscuits is best assessed in terms of structure.

Scent. The scent and taste act pleasant, define and consist of basic scent and taste derived from the aromatic compounds of the essential ingredients, and aromatic additives in raw materials composition.

The scent of the product will meet the required standards, if is characteristic scent of the raw material from which it is derived, without foreign uncharacteristic odors [19].

According to the established average values for the scent of biscuits, with the highest score 2.62 are assessed biscuits "Fructi + Fibregum". The least number of points of 2.34 are assessed biscuits "Fructi + Inulin", and biscuits "Fructi" are evaluated with 2.44 points.

Between biscuits prepared by types of flour Rajgira and Sabudana, which were added at different ratio, in terms of scent, best were rated biscuits made of flour Rajgira and Sabudana in the ratio 2: 3 [13].

From biscuits in which in the recipe composition is added a certain amount of skimmed peanut flour, Yadav et al. [15] noticed highest grades of scent at biscuits containing 5% partly skimmed peanut flour.

The biscuits made of 70% flour and 30% skimmed sesame flour in terms of scent were the worst evaluated during sensor analysis, made by Gernah et al. [17].

Chewing. When chewing the biscuits, the senses of touch, scent and taste register all impressions and evaluate internal quality properties [19].

In terms of chewing biscuits "Fructi" are assessed with a higher number of points (19.3) as compared to biscuits "Fructi + Inulin" and "Fructi + Fibregum", which compared to the same parameters are assessed with 3.09 and 3.01 point (Table 2).

Taste. From the data given in Table 3 is show that with highest average value for taste (4.06 points out of a possible 5) are assessed biscuits "Fructi + Fibregum" and least (3.59 points) the biscuits "Fructi". Biscuits "Fructi + Inulin" are evaluated with 3.71 points.

During sensor analysis of biscuits made of Rajgira and Sabudana, Yenkar et al. [13] is concluded that the biscuits prepared from flour Rajgira and Sabudana in a ratio of 3: 2 are the best in terms of taste.

Based on the results obtained by Yadav et al. [15] during examination of the effect of partly skimmed peanut flour on the characteristics of biscuits, it is shown that in terms of taste are best assessed biscuits which in the its recipe consist of 0% partly skimmed peanut flour.

Jothi et al. [16] based on the results of the conducted sensor analysis of different types of biscuits concluded that white flour biscuits compared to ones which in its composition contain different types of flour show the best quality features in terms of taste.

On the contrary, Gernah et al. [17] concluded that biscuits prepared from 90% white wheat flour and 10% skimmed sesame flour are best compared to the same parameter.

Total sensor evaluation. The sum obtained from individual points of appearance, structure and breaking, scent, chew and taste gives the total assessment (total points) of sensor analysis of biscuits, which in our case is a maximum of 20 points.

According to the results from the performed calculations for total points shown in Table 2, with highest average total mark are assessed biscuits "Fructi + Fibregum" (16.42), less biscuits "Fructi" (15.63), and least biscuits "Fructi + Inulin" (15.53).

Based on sensor evaluation (Table 3) is defined the category of sensor quality in which belong the obtained biscuits (Table 1). Biscuits "Fructi" and "Fructi + Inulin" belong to the group of products with good quality and biscuits "Fructi + Fibregum" in the group of products with very good quality.

From the performed sensor analysis of the biscuits fortified with *Cyperus esculentus* L. as partial substitute for wheat flour (10, 20 and 30%) by Ahmed et al. [20], it is provided the best overall score for biscuits which were with 20% *Cyperus esculentus* L.

Other authors presented their results of sensor analyzes of different types of cookies. For example, Yenkar et al. [13] concluded highest total sensor evaluation of biscuits made from flour Rajgira and Sabudana in the ratio 3:2. Yadav et al. [15] in sensor evaluation of biscuits in which recipe composition is added a certain amount of peanut flour skimmed best, overall final assessment was found the biscuits recipe which composition does not contain skimmed peanut flour.

Between biscuits analyzed by Johti et al. [16] as the best biscuits in the acceptability are assessed control biscuits ie white flour, while others biscuits which in its composition contain different types of flour (potato flour, rice without gluten, a type of Italian mix of flour) are assessed lower. In terms of total acceptance of cookies with different ratio of white wheat flour and sesame skimmed flour, Gernah et al. [17] best results found in biscuits made from 90% white wheat flour and 10% skimmed flour sesame.

Conclusion

From the conducted sensor analysis can be concluded that the biscuits "Fructi + Fibregum" are featured with the best sensor characteristics. Biscuits "Fructi + Fibregum" are most highly rated in terms of layout, structure and crashing, scent and taste, and in terms of chewing are best assessed biscuits "Fructi". Based on the results, can be concluded that the biscuits "Fructi" and "Fructi + Inulin" belong to the group of best products, and biscuits "Fructi + Fibregum" to the group of very good products.

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