

SENSORIAL EVALUATION OF NEW DEVELOPED BISCUITS ENRICHED WITH ORGANIC APPLE AND BASIL POWDERS: PRELIMINARY STUDY

Nela DRAGOMIR¹, Carmen Georgeta NICOLAE¹, Andreea STAN²,
Violeta Alexandra ION², Liliana BĂDULESCU^{2,3}

¹ Faculty of Animal Productions Engineering and Management, University of Agronomic Sciences and Veterinary Medicine of Bucharest, 59 Marasti Blvd, District 1, Bucharest, Romania

² Research Center for Studies of Food Quality and Agricultural Products, University of Agronomic Sciences and Veterinary Medicine of Bucharest, 59 Marasti Blvd, District 1, Bucharest, Romania

³ Faculty of Horticulture, University of Agronomic Sciences and Veterinary Medicine of Bucharest, 59 Marasti Blvd, District 1, Bucharest, Romania

Corresponding author email: carageanela@gmail.com

Abstract

The purpose of the study is to harness ingredients obtained from organic farming, in order to develop a new type of biscuits. Based on the original recipe, these were obtained from seeds and hemp flour and enriched with lyophilized organic apple (pieces and powder) and lyophilized organic basil powder. The organic powders were realized in the framework of the SusOrgPlus project at the Research Centre for Studies of Food Quality and Agricultural Products, and biscuits were obtained in the Bakery Pilot Station, both of University of Agronomic Sciences and Veterinary Medicine of Bucharest. The consumer acceptance testing was performed on 33 consumers and consists of the evaluation of general appearance, colour, taste, aroma, and consistency (Hedonic 5-point scale). The obtained results showed that the new biscuits enriched with lyophilized apple and basil powders were easily accepted by the consumers.

Key words: added value, consumer acceptance, hedonic scale, new product, taste

INTRODUCTION

Organic farming represents the most important alternative to intensive farming, because of its role to protect health and well-being of current and future generations and the environment. According to this principle of organic farming, the organic market increase year by year, all over the world, including in Romania, being characterized by diversity and constantly increasing consumers' demands (Sărăcin and Vasile, 2015). Organic farming creates more job opportunities either for members of the family or for employed personnel, in all production domains: vegetables, fruits, legumes, animals, eggs or milk, as well as for processed products for human consumption (Koufiotis et al., 2016).

Fruits and vegetables are extensively processed and the residues are often discarded. However, due to their rich composition, they could be used to minimize food waste, as value added by-products, with functional properties and in the role of antioxidants (Ferreira et al., 2015; Catană et al., 2018; Rocchetti et al., 2018).

Through the development of intelligent drying processes of food, could be obtain, using raw materials from organic agriculture, high nutritional value ingredients, which can be used as natural additives (Dragomir et al., 2017). In this way, it will be extend the life of the product in the food chain and reduce the impact on the environment. In our days the food technology uses different agents of food improvement. Among them, the consumer is familiar with food additives (Zugravu et al., 2017). The collaboration between food technologist and additive producers is necessary for the optimization and development of networks and technologies, meeting the demands and high expectations of consumers (Bahaciu et al., 2019). In the following, we developed a biscuit recipe that was improved by using organic additives, obtained by controlled and gentle drying procedures, which preserve the initial characteristics of the ingredient.

In the present work, for the study, we used organic products, in the form of natural additives, respectively lyophilized apple pieces,

lyophilized apple powder and lyophilized basil powder.

The organic ingredients used were obtained at the Research Center for Studies of Food Quality and Agricultural Products from USAMV Bucharest, within the SusOrgPlus project: Intelligent food processing chains, natural additives and colourants, which aims to develop advanced processing technologies for organic products and by-products (Bujor and Bădulescu, 2019). The aim of the study is to use of these organic ingredients in a new biscuit recipe, the qualitative and sensory evaluation of the obtained products; and the analysis of the degree of consumer acceptance for the organic food products enriched with food additives and natural dyes.

Biscuits enriched with lyophilized apple powder and lyophilized basil powder, are based on fat dough, in which the classic wheat flour was partially replaced with hemp flour and hemp seeds husked (Dragomir and Nicolae, 2019; Dragomir et al., 2019). The apple powder is obtained from apples, organic Gala variety, which was dehydrated by the lyophilisation process. Apple powder it is an important source of polyphenols with high antioxidant capacity. Its presence in the recipe, balances the taste and aroma of the finished product, and the pieces of lyophilized apple give a pleasant texture and aroma to the product (Bădulescu et al., 2019).

Basil (*Ocimum basilicum* L.) belongs to aromatic plants due to their volatile compounds presented especially in leaves and flowering tops. These basil parts are used since antiquity for food preservation, flavouring, and as medicine, because of high antioxidant, antibacterial and antifungal activity of volatile oils, being good sources of natural antimicrobial and antioxidant agents, with possible application in food industry, cosmetics or medicine (Avetisyan et al., 2017).

By lyophilised basil retains the characteristics intense colour and flavour. Lyophilised basil powder is aromatic, slightly sweet, with spicy notes in taste. Because, it has a great capacity to rehydrate in the presence of water from the dough, the original character, such as the taste, colour and aroma specific to the basil, is present in the new preparation. Added the powder from the lyophilized basil aromatizes to the dough balances the taste and increases the

preservation of final product. According to Złotek (2018), cakes enriched with basil (both control and elicited) may be used in human diet (also by diabetic patients) as functional foods. Husked hemp seeds and hemp flour are added for texture, taste, colour, high protein and fiber content, as well as high nutritional value (William et al., 2019; Di Cairano et al., 2018). The use of husked hemp seeds and hemp flour, as the raw material, is considered promising. At the global level, there is a real interest in this culture, not only as a point of interest for private enterprises, but it is also the focus of large government programs (Lukin and Bitiutskikh, 2017).

MATERIALS AND METHODS

Recipes development and organic food products made

The technology of obtaining the products has been adapted according to the behaviour of the food additives and the natural organic dyes that are the object of the study.

Materials used in our study included:

- lyophilized organic apple (pieces and powder);
- lyophilized organic basil powder;
- hemp flour and husked hemp seeds.

The obtained products were tested in three repetitions until the best recipe was obtained.

All products were purchased from retail specialty stores with organic products, except for organic apple and basil powders, which were realized in the framework of the SusOrgPlus project at the Research Centre for Studies of Food Quality and Agricultural Products, from USAMV Bucharest.

The product was made in the Bakery Pilot Station of the Faculty of Animal Productions Engineering and Management, from USAMV Bucharest, within the SusOrgPlus project support.

The biscuits are obtained using a basic recipe that is used as a test control (ingredients: butter, wheat flour, unfinished brown sugar, hemp protein flour, husked hemp seeds, yolk, salt, baking powder). Biscuits obtained by adding organic lyophilized apple in the form of pieces and powder, lyophilized basil powder were used for the test sample.

Sensorial evaluation

The sensorial evaluation of biscuits was carried out in order to observe the impact of organic apple and basil powders incorporation, on its sensory characteristics.

The sensorial evaluation was conducted in three parts. A research group, consisting of five members, evaluated the biscuits to determine if the product was viable. A positive response warranted further testing with a small group of consumers to obtain quantitative data regarding acceptability and attribute analysis.

A sensory evaluation for consumer acceptance testing was performed on another two consumer groups, of un-trained panellists, using a 5-point Hedonic scale (scale: 1-dislike extremely; 2-dislike slightly; 3-neither like nor dislike; 4-like slightly; 5-like extremely) to determine the level of acceptance of biscuits enriched with organic apple and basil powders (Spence, 2016; 2018).

Consumer acceptance testing was performed in the Sensory Analysis Laboratory of the Research Center for Studies of Food Quality and Agricultural Products, USAMV Bucharest.

RESULTS AND DISCUSSIONS

Recipes development and organic food products made

For the biscuits enriched with organic apple powder and basil powders, there were used the following ingredients: butter, wheat flour, unrefined brown sugar, hemp protein flour, husked hemp seeds, yolk, salt, baking powder, 0.5% lyophilized apple pieces and 0.15% lyophilized apple powder, and 0.1% lyophilized basil powder. It was obtained, a healthy organic biscuit, with specific sensorial characteristics, and with high nutritive value.

The technology of fat-based dough includes the following stages: raw ingredients preparation for production; emulsion preparation, dough kneading, forming the pieces dough, and baking the finished product.

The production technology involved the following steps:

- The emulsion preparation: the ingredients are placed in a mixing bowl: unrefined sugar, butter, yolk, salt, and organic powders. The yolks together with lyophilized apple (pieces and powder) and lyophilized basil

powder are mixed and left to rest, so that the organic powders hydrate and incorporate more easily into the dough. The ingredients are mixed, in the planetary mixer, for 15 minutes until the mixture reaches an even structure, and the mixture is creamy and fluffy.

- The dough kneading: to the mixture are added the husked hemp seeds and hemp flour, and the baking powder. The blending is done for 5 minutes. It is recommended that hemp flour be mixed with other flours in a proportion of maximum 20%, and the products will have a more pronounced taste of hemp, a brown colour.

- Forming the pieces dough: from the resulted composition is made a roll, which is wrapped in baking paper and put at cold for 10 minutes. The chilled dough is laminated and formed according to wishes.

- Baking the products: baking is oven at a temperature of 180-200°C for 10-15 minutes.

Following the evaluation of the organoleptic characteristics, the biscuits enriched with organic lyophilized apple powder and lyophilized basil powder, are very tender and extremely tasty. They have a pleasant taste of walnut and coffee and the flavour of apples is present. We find the aromatic notes specific to the introduced basil, which highlighted the product from anonymity, also observed a balanced taste of sweet-aromatic-slightly sour acid specific to dehydrated apple, introduced in two forms: small pieces and powder. Hemp flour biscuits have a less appealing appearance and a darker colour due to the use of hemp flour which has changed the overall appearance of the finished product. This colour characteristic due to their high polyphenols content, as well as their crispiness was observed also by Korus et al. (2017), Norajit et al. (2011), Šottníková et al. (2019). These aspects can be corrected by icing the biscuits, with organic dark chocolate or another ingredients.

Sensorial evaluation

The first group consisting of 33 members in panel group, of different ages, were chosen to determine the level of acceptance of biscuits enriched with organic apple and basil powders. The panel members were requested to measure the terms identifying sensorial characteristics

and to use the score. Judgments were made through rating the products on a 5-point Hedonic scale with corresponding descriptive terms ranging from 5 'like extremely' to 1 'dislike extremely' (Figure 1).

The sensorial tests of the biscuits were made considering: first appearance, section appearance, colour, flavour and smell, and overall taste of the sample.

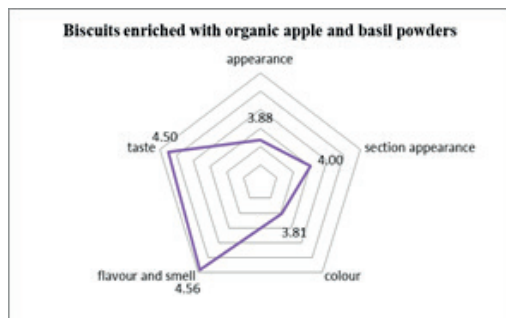


Figure 1. Consumer acceptability scores on a 5-point Hedonic scale for biscuits

The hemp flour biscuits did not receive a high score for colour (3.81) and appearance (3.88), because the use of hemp flour changed the overall appearance of the finished product. These aspects can be corrected by frosting biscuits with dark chocolate or other glaze and decoration.

In the section, the biscuits are slightly crumbly and tender, specific characteristics for this product and the apple pieces are flavoured and easy to chew. They are extremely tasty. Their taste like walnut and coffee and the flavour of apples is present.

The flavour and taste received scores over 4.5. The consumers recognized the notes of lyophilized basil powder which highlighted the product, and the balance of sweet - aromatic - slightly sour taste given by the lyophilized apple introduced in two forms: pieces and powder.

We consider that the product has been accepted by the consumers very easily, and the weighted average grade of 4.12 can be modified very easily by printing a new shape of the product or by decorating with chocolate or something else. In the second sensory evaluation session, there were analysed two biscuits samples.

One sample was prepared using the simple biscuit recipe (TC - test control) and the second

one was enriched with organic apple powder and organic basil powder (TS - test sample).

The second group consisting of 10 members, was asked to evaluate the two cookie samples.

In order to reach the objective of sensory research, it was considered to organize an internal group of trained evaluators and subsequently to carry out sensory analysis tests specific to obtaining sensory profiles. For this purpose, the applications were made on food matrices using two formulas in pairs for each matrix tested: a formula made with standard ingredients (TC) and for the same matrix, another formula in which were introduced the ingredients obtained in the SusOrgPlus project (TS) (Figure 2).



Figure 2. Biscuits enriched with organic lyophilized apple powder and lyophilised basil powder: TC (right) and TS (left)

The same set of sensory descriptors, identified as representative for highlighting the differences in sensorial perception resulted on the two samples, were evaluated using the 5-point Hedonic Scale for both products in each pair of food matrices.

To achieve the partial sensory profiles, the sensory expert has completed 5 characteristic attributes for each sample. After scaling the average values of the 5 attributes and their representation on a spider diagram, there were obtained the sensory profile for each of the 2 tested products. For an easy highlighting of the profile differences within the pairs of recipes, they were represented in Figure 3.

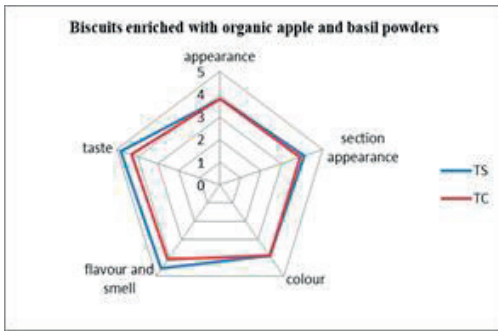


Figure 3. Spider plot of organoleptic properties of biscuits enriched with apple and basil powder made using the test control and test sample

It can be observed that out of the 5 attributes, following the sensory analysis, the TS sample received a better evaluation of taste, flavour and smell, these attributes being brought by the addition of organic ingredients tested.

Following the test, an improvement in the appearance, flavour and smell, and taste of the TC was observed compared to the TS sample (Figure 4).

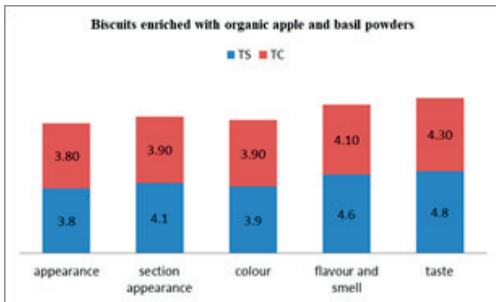


Figure 4. Results obtained after the sensory analysis of biscuit samples

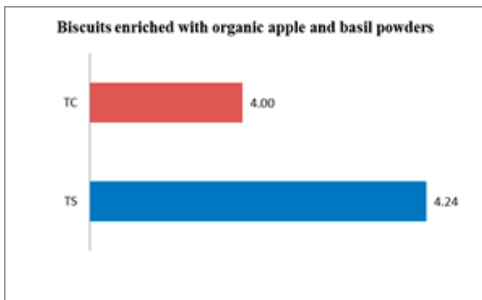


Figure 5. Sensory analysis 5-point Hedonic scale

Following the evaluation, the biscuits enriched with organic apple and basil powders (TS)

achieved a score of 4.24 compared to TC which had only 4.00 (Figure 5).

Nutrient Content

Nutrient content it was calculated using a program nutritional development tool, *Softmedia programme* (<http://softfedima.ro/>).

Softmedia programme makes it easy to prepare a nutrition facts panel, nutrition data sheet, ingredient statement for any food product. Formulas can be adjusted for moisture and/or fat content. Information can be printed, saved as a PDF document.

For the calculation of the nutritional value, losses in baking and cooling of 10% were taken into account. Table 1 shows the nutritional values for 100 g of biscuits enriched with organic apple and basil powders. The calculated energy value is 628.6 kcal for 100 g of product.

Table 1. Nutritional values for 100 g of Biscuits enriched with organic apple and basil powders

Average nutritional values for 100 g biscuits	
Energy value	2604.3 KJ
	628.6 kcal
Fat	52.4
Of which saturated fatty acids	32.6
Carbohydrates	31.6
Of which sugars	17.1
Fiber	3.5
Protein	5.9
Salt	0.6

They can be mentioned as products are allergenic potential due to the necessary ingredients and the product contains gluten, lactose, may contain traces of egg protein (avidin).

CONCLUSIONS

The use of organic additives in the form of powder obtained in the the SusOrgPlus project at the Research Centre for Studies of Food Quality and Agricultural Products, USAMV Bucharest, to obtaining Biscuits enriched with organic apple and basil powders, has increased sensory value and is accepted by consumers.

The evaluation of the organoleptic characteristics emphasized that biscuits enriched with organic lyophilized apple powder and lyophilised basil powder, are very tender and extremely tasty. They have a pleasant taste

of walnut and coffee and the flavour of apples is present. The basil notes are felt, and also are observed a balanced taste of sweet-aromatic-slightly sour acid specific to dehydrated apple, added in two forms: small pieces and powder.

It may be concluded from the study that the organic apple and basil powders can be successfully incorporated in biscuits up to a level of 1% to yield biscuits of enhanced nutritional quality with acceptable sensory attributes.

All the proposed activities were carried out in accordance with the achievement of the proposed objective.

The Sensory Analysis tests revealed a differentiated influence of organic ingredients SusOrgPlus in the sensory quality of food products.

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