Bulletin of the *Transilvania* University of Braşov
Series II: Forestry • Wood Industry • Agricultural Food Engineering • Vol. 10 (59) No.1 - 2017

A NOVEL APPROACH FOR A HEALTHY LIFESTYLE – DIETARY FIBER AS A FUNCTIONAL INGREDIENT IN BREADMAKING

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Abstract: *The importance of fiber in nutrition is an intensely discussed aspect over time. Food fibers are the fraction of the plant's edible part or extracts that are resistant to digestion and absorption by supporting one or more physiologically beneficial effects. Fiber offers a variety of health benefits and is essential for reducing the risk of developing chronic diseases. The purpose of this paper is to study the influence of the addition of fiber derived from vegetable sources in the mass of the product on the properties of the finished product, to define a recipe for creating a product appreciated as a functional food and an optimal procedure in order to obtain the desired results, to determine the optimal quantity of plant matter to be introduced into the product mass in order to confer the proper features and to obtain a product that posses a content of food fibers as high as is possible.*

Key words: *fiber, cranberry, apple peel, breadmaking, health.*

1. Introduction

In the current context, it is generally accepted the fact that a daily consumption of fruits, vegetables, cereals or products obtained by processing it has a beneficial effect on the health of the consumer. Taking into account the nutritional aspect, fiber-rich foods reflect the bivalent - energy and nutritional profile of the raw materials from which it is obtained. In order to satisfy this purpose, have been created food products that are able to provide the daily fiber requirements and generate the desired effects during consumption.

Nowadays, the preference and interest in consuming products with implicit benefits for body health has been drawing the producers interest in using ingredients with specific and well-defined functions.

It is currently well-known and generally accepted that bread and bakery products in various forms cover the nutritional needs of the body and their consumption has a beneficial effect on the health of the population.

According to current considerations,

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food fibers are described as ingredients with specific functions in the production of foods with a defined role for consumers health. Because of the fiber structure that gives them double properties - to be soluble and insoluble, they have the technological ability to gel, link hydrophilic structures, create structures, and can be used as a substitute for fat [2].

Thus, the consumer's tendency to create a lifestyle adapted to physiological and nutritional needs has been observed, considering this perspective as the most appropriate way to prevent cardiovascular, circulatory, or digestive diseases [4].

In order to support this category of consumers there is a continuous attempt to capitalize on the curative and preventive properties of fruits and vegetables. Due to the easy access and wide variation of the plant fiber sources, there have been made several studies and have been highlighted their beneficial character [7].

The current study focuses on the highlighting the nutritional benefits of two fruits belonging to the cultivated flora - Malus Domestica and spontaneous - the cranberry (Vaccinium Oxycoccos) of the country, that were used in terms of food fiber intake.

An important aspect of the chemical composition of apple and cranberry is the ratio of the fiber content found in the core and the peel of the fruit, the peel having the highest proportion of fiber content [3].

Unlike the fiber content of cereals, in the apple peel there is a high percentage of soluble fiber fractions due to the high amount of pectin polymer. In relation to the fiber content of the apple taken as a whole, pulp and peel, it was found that the highest proportion of food fiber is found in the peel - 0.91% of which 0.46% is insoluble fiber and 0.43% being soluble fiber. The cranberry is defined by 65.47% fiber content, of which 60.34% are insoluble fibers, and 5.15% are soluble fibers. The exciting chemical composition of the cranberry classifies it among multi-valent fruit primarily due to high fiber intake, increased antioxidant content and the predominance of vitamins A, E and K.

The best option to enrich food nutritional quality by adding food fibers is adding fiber-rich vegetable matter to the product's composition - fruit fractions - apple peel and cranberry in various forms - raw or dehydrated [4].

In this way, the technological process does not undergo significant changes, the fiber intake is rigorously controlled and the organoleptic impact of the consumer is not so significant, being much more easier to accept a product determined by a white background than a product with a color which can be associated in a negative way by the consumer [5].

A high rate of use in baking have the insoluble fibers - cellulose and lignin, which are abundant in apple and cranberry. Fibers are used in a proportion of 5-35% related to the processed flour, depending on the desired fiber content of the bread.

2. Materials and Methods

For the obtaining of bakery products with addition of food fibers were used as raw materials: wheat flour type 650, yeast culture, sugar, food fibers (apple peel, raw cranberry and dehydrated cranberry), salt, water.

In order to create the intended bread types, a series of samples were made, weighting 300 g where the proportion of added cranberry was varied from 10% to 30% and in case of bread with apple peel, the addition was made with a proportion of 30% shell. In order to perform a comparative analysis, a blank sample was obtained without fiber addition.

The research then focused on the dough preparation stage, manually performed, by the biphasic indirect method. In advance,

has been obtained the sourdough starter – fermentation leaven. Yeast, water and flour were used to obtain the leaven, resulting a sticky liquid, with easily constituting consistency in the dough mass.

The organoleptic analysis of the raw materials - flour was carried out in accordance with the provisions of SR 90-88. After performing the analysis, the values obtained for the flour as raw material, it was found that it fits to the provisions of the standard, the values obtained complying with the provisions of the standards (humidity 14.6% - this quality index is important because it has a significant impact on the bread process and the efficiency of the process). Being a product with high hygroscopicity degree, flour changes its relative humidity, depending on the storage conditions parameters.

Deterination of acidity was performed according to SR 90:2007 by the water suspension method in order to determine the amount of 0.1 N sodium hydroxide necessary to neutralize flour acidity, by reference to 100 g of the sample to be analyzed. The result obtained was 2.73 °T, a value accepted by standards.

Determination of wet gluten content was carried out according to the method indicated by SR EN ISO 21415-1 and SR EN ISO 21415-2 by washing the dough sample obtained by addition of flour to be analyzed with a 2% salt solution followed by the washing of the gluten obtained until dryness. The value obtained was 31.9%, the value exceeding the minimum acceptability limit set by the standard, of 26%.

Determination of the hydration capacity was determined in order to establish the optimal amount of water required to form dough of normal consistency, under the established conditions, according to STAS 90-88. The result was 68.9%, a value above the lower limit set by the current standard - 60%.

By analysing the results of the bakery indices of the flour used in comparison with the values provided by the standards, it is observed that the flour meets the required quality requirements, within the ranges stipulated by the standards. This will also be reflected in the quality indices of the finished product, influencing its characteristics.

Cranberry is well known for its antioxidant and nutritional properties. In this experimental research, the cranberries were used with the purpose of highlighting their potential in order to obtain new products with improved nutritional properties.

The chemical composition of cranberry is given by the nutrient content (fiber, manganese, vitamin C, vitamin E, copper, pantothenic acid, vitamin K), phytonutrients (phenolic acid, proanthocyanidins, anthocyanins, flavonoids, triterpenoids), acids (citric acid, malic acid, quinonic acid), sugars, water, as well as the traces of metals found in its structure.

While ordinary nutrients such as vitamin C and fiber play a very important role concerning the health benefits of cranberry. Taking into account this perspective, it is interesting to draw attention on the grouping of phytonutrients, a group that has an important role in contemporary nutrition.

The fiber – rich chemical composition of the apple was also emphasized in this study, with a particular appreciation of the peel of the apple, considered to be the most important part of the fruit according to the chemical composition, where the largest amount of food fibers resides, related to the other anatomical parts of the fruit (2.1 g of fiber / 100 g peel).

3. Results and Discussions

The purpose of the experimental research was to create bakery products with high fiber content derived from vegatable sources.

After obtaining the samples, with cranberry addition in various proportions, apple peel in proportion of 30% and the blank sample, the organoleptic appreciation (Table 1) of the bread quality was performed using the scoring scheme (Figure 1).

Analyzing the information in the chart represented in Figure 1, it is easily observed how P1 and P4 obtained an equal score to PM, being the best organoleptically appreciated sample by the evaluators. In contrast, P1 scored a lower score of 26 points and P3 was rated as the most unsatisfactory from the consumer point of view, being quantified with a value of 24 points. Analyzing the values attributed to each product, it can be said that the addition of apple and cranberry in the analyzed samples was appreciated positively from the point of view of the consumer's acceptance.

The addition of vegetable origin fiber - 10% cranberry, determines a number of changes that affect the qualitative properties of the finished product. The most significant effect observed through the addition of fiber in bread dough is revealed in terms of volume and porosity (Figures 2-5), with a decrease in bread volume compared to the blank sample. Porosity also registered a lower value - 71.9%, compared to the blank sample whose porosity was 74% (Table 2).

Organoleptic evaluation of samples Table 1

Sample coding	Maximum value	Score awarded
PM	30	28
P1	30	26
P2	30	28
P3	30	24
P4	30	28

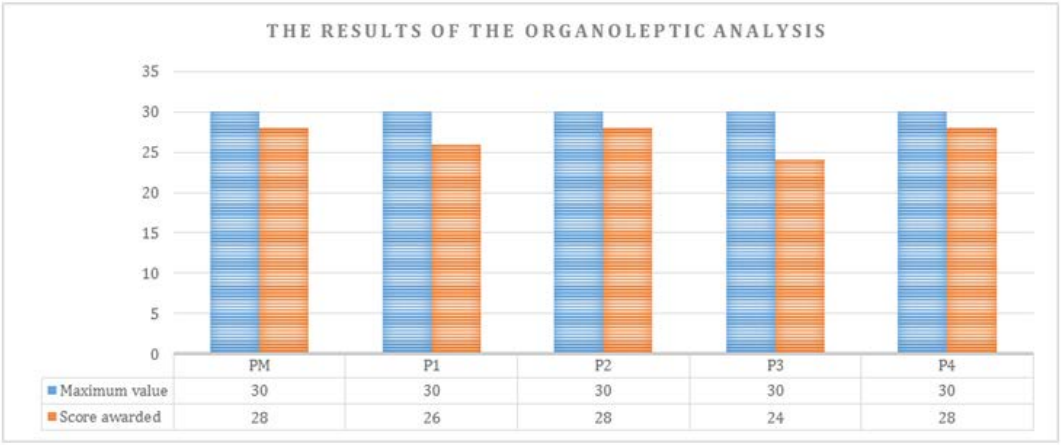

Fig. 1. *The organoleptic evaluation of bread samples*

Physico – chemical analysis of bread samples Table 2

Sample coding	Determined parameter		
	Volume [cm^3]	Porosity [%]	Moisture of crumb [%]
PM	285,5	71,9	43,7
P1	288,5	72,7	44,2
P2	288	72,7	44,2
P3	287,3	72,5	43,3
P4	297,1	74	43,1

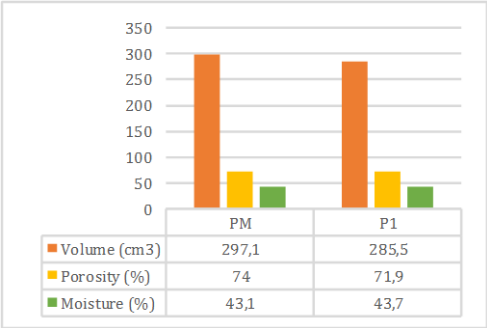

Fig. 2. *Analysis of volume, porosity and humidity of sample with 20% cranberry addition compared to blank sample*

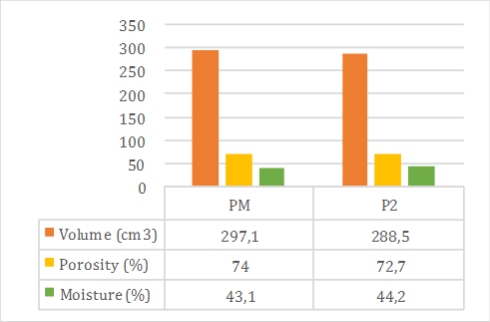

Fig. 3. *Analysis of volume, porosity and humidity of sample with 10% cranberry addition compared to blank sample*

This is due to the introduction of food fibers into the dough mass, their mass affects the pore distribution and decreases the volume.

The humidity of the core is a quality of bread quality. It can be seen that the addition of fibers did not cause unwanted changes in the humidity of the bread crumb, keeping it within the limits accepted by the standard and close to the ones quantified in the case of the blank sample taken as a reference.

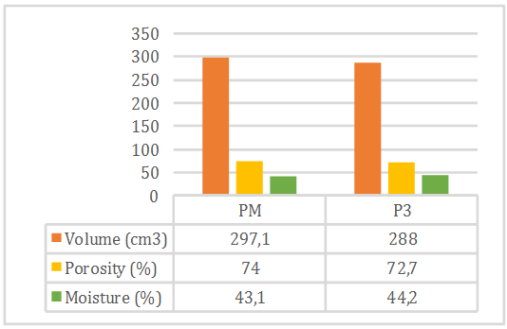

Fig. 4. *Analysis of volume, porosity and humidity of sample with 30% cranberry addition compared to blank sample*

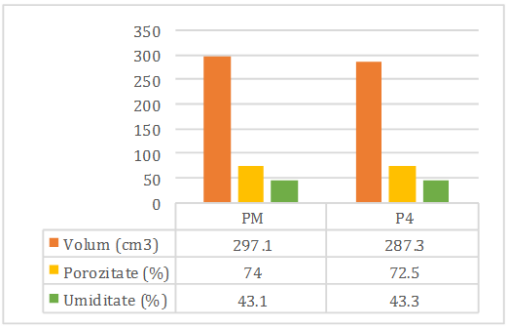

Fig. 5. *Analysis of volume, porosity and humidity of sample with 30% cranberry addition compared to blank sample*

Unlike P1, P2 recorded porosity and humidity values close to those obtained for samples with less fiber. Thus, it can be argued that increasing the amount of fiber added to the dough mass does not significantly alter the physicochemical

properties of the product.

Remarkable for P2 is that the moisture percentage of the core has increased from 43.7% for P1 to 44.2% (Table 2), which indicates the fact that the addition of cranberry required the increase of this parameter by the specific humidity of the fruit.

Comparing with previous samples, P3 suffered an almost insignificant decrease in volume, resulting in a value of 288 cm^3 (Table 2). The two parameters simultaneous analyzed determined values equal to those obtained for the other samples. The change in volume is directly proportional to the amount of cranberry added. As the amount increases, the lower the volume, due to the cranberry mass, which causes a decrease in the absorption of the fermentation gases by the flour.

Regarding the addition of 30% apple peel fiber (Figure 6), it can be seen how the volume has decreased slightly compared to the blank sample, but has also recorded an approximate value to that obtained with the addition of cranberry in varying amounts (Figures 7 and 8), indicating that the addition of apple peel does not cause the product volume to be affected.

In case of porosity, a decrease in the value obtained was observed, below the minimum value mentioned in the standard.

Fig. 6. *Apple peel bread 30%*

Fig. 7. *Bread with cranberry addition*

Fig. 8. *Bread with cranberry addiction in different proportions*

This value is justified by the fact that the addition of shredded apple pell interacts with gluten structures, preventing the development of proper porosity.

Following the variation of moisture during baking, it has been observed that the dough containing apple peel fiber increases its moisture percentage compared with the blank sample, this fact due to the percentage of moisture naturally occurring in the chemical composition of the apple peel, which gives the finished product a higher moisture content.

By analyzing the previous graphs, we can see how P2 has the most developed volume and with the increase of the amount of added fiber, the volume of bread is reduced. The addition of fibers from different sources, in varying proportions, has been shown to have an essential influence on the quality of the products obtained. Following the addition of fibers in varying proportions, an improvement in

organoleptic properties - taste and smell - was observed, while the volume was diminished as the amount of fiber introduced increased.

Also, the quality of the product diminishes once the amount of fiber increases, the best results being obtained by the addition of 20% fiber.

Failure to comply with the standard in the case of cranberry and apple peel addition in bread dough is not a negative aspect, due to the fact that the addition of cranberry and apple peel has the property to give the product their own properties.

Due to the fact that this is a new product, the standard does not contain clear provisions regarding the values to be respected, so the reporting is made by referring to the values provided for the products already existing.

4. Conclusions

The main objective of the experimental research was to obtain bakery products with improved nutritional properties by the addition of Vaccinium oxycoccos, known as cranberry, as well as Malus domestica, the common apple.

After studying the properties of cranberries and apple as a whole and its fractions, it was decided to use them as an ingredient for obtaining new assortments of bread classified as functional foods, highlighting the intake of dietary fiber brought with its introduction into the consistency of the new product.

The use of food fibers in order to obtain a range of bakery products in various proportions (10%, 20% and 30%) is remarkable by giving effects on the properties of the obtained dough mass and the finished product obtained after heat treatment. Thereby, it has been observed that the introduction of fibrous matter into the mass of the products reduces the bread volume.

As a result of the addition of fibers to the kneaded dough mass, an increase in the amount of water absorbed by the dough has been observed, indicating that the fibers can support the hydration of the dough, which is considered to be a beneficial element for production. Another beneficial implication of the water absorption capacity of the food fibers is that it can provide the product pleasant organoleptic characteristics. The bread obtained showed organoleptic properties similar to those for acidic bread, product that is increasingly prevalent in consumer preferences.

Also, due to the high acidity rate of the added cranberries, the acidity has been developed on the whole product. An acidic environment is inappropriate for the development of microorganisms in the product mass, which contributes to its rating as a product with a high degree of perishability, giving it pleasant organoleptic properties over a longer period of time compared to existing products in the same category.

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