FUNCTIONAL CONFECTIONERY FROM PUMPKIN PULP

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Abstract: Modern foods are characterized by deficiencies of essential nutrients (vitamins, minerals), and by an increased calorific value. This causes many disabilities, the cause of frequent nutritional diseases: diabetes, obesity, constipation, gastritis, etc. In case of the patisserie and bakery products, which consumption in Moldova exceeds considerably (1.5 times) the average consumption in EU countries, it is particularly important to reduce calorific value and increase the biological value of the products.

In this scientific paper we present lean functional confectionery with added pumpkin paste, meant to diversify the range pastries and help to enhance the biological value of the products due to the rich content of vitamins, micro- and macronutriments contained in the pumpkin paste. We have conducted researches about the basic raw material used in the preparation of confectionery products such as flour, pumpkin. Studies have shown that the quality of the raw material used was of high quality. We investigated three varieties of pumpkin cultivated in the Republic of Moldova (Aport; Crown prince; Butternap). For research was selected the pumpkin "Crown Prince" because of its spread and optimal color intensity in the obtained pastries.

Pastry (bun buns, cake based on sunflower oil, cake-based vegetable margarine, cookie-based margarines and mayonnaise plant) were prepared with the addition of pulp pumpkin in concentrations of 40% 30%, 20% buns, cakes and 25%, 20%, 15% biscuit. Studies have shown that the addition of 20% paste pumpkin to flour, improves not only the nutritional values of products during Lent, but also the appearance, taste, smell and its color, without affecting other physico-chemical (dry porosity, the number of units / kg).

An extremely important parameter for food is the antioxidant capacity and also the oxidative stability. The paper analyzed the ability to inhibit hydrogen peroxide (HPSA) of the products during the expected term of validity and the development of lipid fraction of the pastry with the addition of pumpkin pulp compared to control samples.

Finally, the microbiological analysis of raw materials and products made with pumpkin paste allowed to establish the optimal storage duration of the products.

Introduction

The principle formulated by Hippocrates nearly 2,500 years ago is- *"The food be your medicine and medicine food"* espoused by Hippocrates, presents an enhanced interest in the XXI century, when the light of scientific and technical evolution visibly changed the lifestyle of current generations.

The general concern for the development of functional foods has generated the need to use food ingredients with an important role in maintaining and improving health. Thus, current food products are incorporating a volume ever higher of technical and scientific progress and researches in modern food technology are based on creating new functional nutrients using traditional raw materials; optimizing functional nutrients in raw materials and food; increasing their bioavailability.

Functional foods are products that contain various biologically active compounds and which, consumed within current nutrition, helps in the maintenance of optimal physical, psychological and mental population. European Commission's Concerted Action on Functional Food Science in Europe (FUFOSE) defined functional foods as:

"*A nutrient that can easily be considered only functional food if proved satisfactorily that it can positively change one or more target-functions, in addition to nutritional effects, to constantly improve the health and well-being, while reducing the risk of any disease* "[1]. As functional foods are part of daily diet, their effects are lasting. For example, food can be considered functional foods containing probiotics, prebiotics, antioxidants.

As a result of metabolic processes in the body are generated reactive oxygen species (ROS) [2]. SRO are highly reactive molecules, due to the unpaired electron in their structure, produced by molecular oxigen as a result of normal cellular metabolism [3]. Cellular components that are most quickly affected by the action SRO are lipids

(peroxidation of unsaturated fatty acids in membranes), proteins (distortion), carbohydrates and nucleic acids.

Under the action of SRO , the antioxidant system reacts by a series of redox reactions.

Oxidative damage is the cause of cardiovascular diseases, dyslipidemia and obesity, cancer or Alzheimer's. Oxidative stress is counteracted by antioxidants. They are designed to neutralize free radicals by donating an electron or hydrogenthereby inhibiting the oxidative mechanisms that lead to chronic and degenerative diseases.

Due to the rich content in nutrients, the pumpkin exhibit anti-inflammatory and antioxidant properties, also anticancer and anti-diabetic effect [6]. Being original from South America, known for over 4000 years ago, today they are grown in temperate regions of the worldwide, reaching an output of 19 million tons per year. China is ranked first with an amount of 1/3 of overall productivity. In Moldova, the pumpkin is grown in agricultural enterprises and farms with an average productivity of 32 thousand annual tons - pumpkins and 17 thousand tons of zucchini.

Catering, pumpkin pulp is consumed crude-in salads and juices; thermal-treated in salads and snacks (Inflatable pumpkin, Asian salad), soup (pumpkin soup baked with rosemary and cumin), basic dishes (stuffed pumpkin), gaskets (pilaf with vegetables baked pumpkin), desserts (sweet pumpkin tart).

But pumpkin processing, to a larger scale in the food industry, presents particular interest. The main purpose of this paper is to get prepared lean pumpkin pastry with the addition of agents texture of pumpkin pulp. To achieve this goal, the research was focused on the following:

- The selection of pumpkin breed (variety) for the processing technology;
- Optimizing the producing technology ;
- The study of the physicochemical properties and antioxidant capacity of the products in gastrointestinal digestion;
- Oxidative stability and microbiological analysis of the products.

Materials and analysis methods

Infrared spectroscopy (IR) IR spectra were obtained on Bruker FT-IR spectrophotometer Vertex 70, analyzing the hexane extract chemicals from the pulp of the pumpkin and pastry pumpkin pulp obtained under.

The microbiological control of the products was conducted to assess the influence of pumpkin pulp on the development process of microbiota in the products. The paper used the method of seeding on heavy media, Sabouraud method [5]. Sowing

heavy media in a Petri dish is performed by different methods depending on the growth of microorganisms in the environment or on its surface. Sterilization of media is carried out at a temperature of 120 °C for 20 minutes in an autoclave. Insert material for research on environmental gelled surface with spatula. Spatula circular motion of culture are distributed all over the environment. Growth temperature: 23 – 37ºC.

The ability to inhibit hydrogen peroxide (HPSA) was analyzed according to the method published by *Nagulendran* [KR. NAGULENDRAN et al., 2007].

Results and discussions

For the research were selected lean pastries. In the recipes that contained artificial colorants, they were excluded and replaced with natural coloring pumpkin pulp. It was used in the preparation of pumpkin pasta in pumpkin variety "Crown Prince".

Tab 2. Analysis intensity of IR bands picture intensity of some parts of the pumpkin pastries

Type of chemical bond	*Pumpkin pasta"Crewn prince"*		*Bun with pumpkin paste*	
	PeackIR,cm^{-1}	Intensity	PeackIR,cm^{-1}	Intensity
$CH_3CH_3CH_2$	2965	**** ****	2958 2924	*** ****
CH_3 C=O CH CH_3	2929 2877	*** *	2855 1977	*** *
C-O	1977 1749	** **	1748 1465	*** **
C-O	1459 1379	** *	1419 1378	* **
	1241 1161	** *	1237 1161	* **
C –$(CH_2)_n$ -C	1099 1065	* * *	1118 1099	** *
	886 758 724	* *	967 904	* **
			884 869 724	* * **

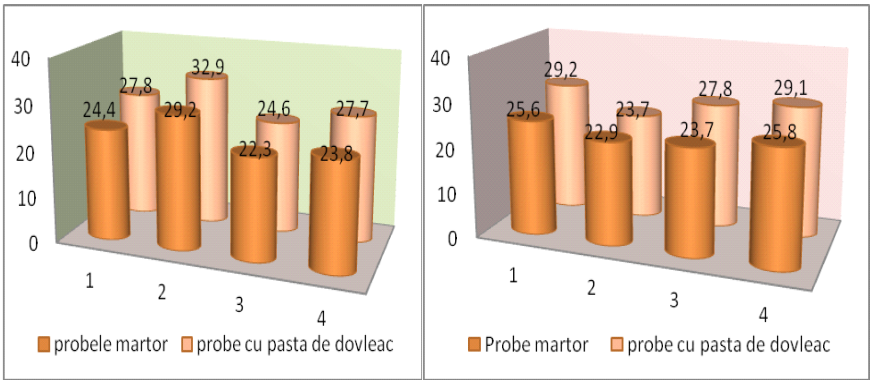
The obtained results prove the presence of the same oscillations for the pumpkin pasta and the bun with pumpkin paste, which indicates the transfer of similar chemical compounds in the researched products.

The variation of the capacity of inhibiting the hydrogen peroxide in pastries

It is important that pastry possess not only energy and sensory, but also beneficial effects to the body. One of the basic features of the antioxidant effect of the products may serve to determine the amount of inhibition of the ability of hydrogen peroxide.

The results of the inhibition capacity of hydrogen peroxide at pH = 2 are shown in Figure 1a. We can mention that in the case of products with added vegetable margarine (cupcakes based on vegetal margarine and buns based on vegetal margarines and mayonnaise) with the addition of pasta pumpkin affects less the ability to inhibit hydrogen peroxide. The presence of vegetable margarine and mayonnaise slightly reduced the ability to inhibit hydrogen peroxide (in vitro gastric digestion) compared to the oil, but it is still higher than the control sample.

The inhibition of hydrogen peroxide at pH= 8.2 shown in Figure 1b,generally vary slightly (by 2-5%), but is always higher in samples with pumpkin paste, taken in relation to the controls.



a b

Fig. 1. The variation of the inhibiting ability of hydrogen peroxide at:
a - pH = 2 (in vitro gastric digestion); b - pH 8.2 (digestion TRIPS)
1 – bunbuns; 2 - cake based on vegetable margarine; 3 - cake based on sunflower oil;
4 - cookie-based vegetable margarine and mayonnaise.

Overall, the total capacity of inhibiting hydrogen peroxide (under in vitro gastrointestinal digestion) varies according to Figure 2.

In conclusion, we can state that in all cases the samples with added pulp pumpkin exhibit inhibitory capacity of hydrogen peroxide increased compared to control samples, which demonstrates that the biological value of these products is higher than in the controls.

The microbiological study was done by identifying NTMD NTG and raw materials and the development of NTG, MTMD during storage of finished products. For fresh pumpkin NTG did not exceed the standard rules, were not identified pathogenic bacteria, including Staphylococcus genus. Wheat flour were not identified bacteria of the genus B. mesentericus, B. subtilis and B. licheniformis (extent of disease).

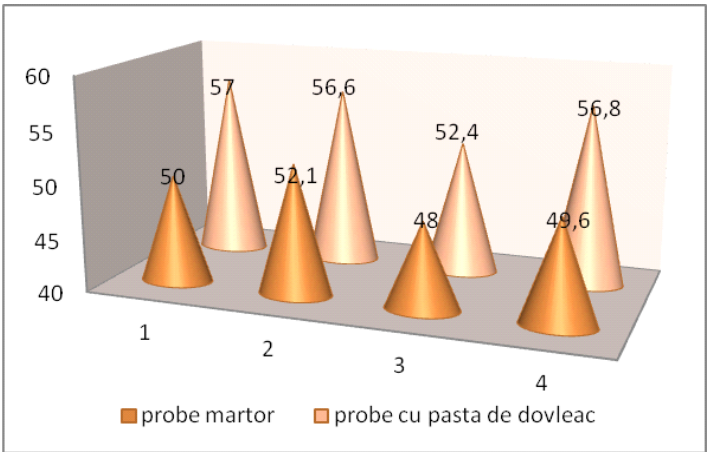


Fig. 2. Variations of the total capacity of inhibiting hydrogen peroxide in vitro gastrointestinal digestion: 1 - bun buns; 2 - cake based on vegetable margarine; 3 - cake based on sunflower oil;

4 - cookie-based vegetable margarine and mayonnaise.

The results obtained from the analysis pumpkin fresh, thawed and cooked (fig. 3), shows that during processing (cleaning, shredding) pumpkin was infected (90 NFC / g), after freezing at temperatures (-15 C) microorganisms or multiply up to 420 NFC / g, since freezing does not destroy microorganisms, but keep them in a dormant after thawing allow their developers.

After extending the process of processing pumpkin thawed, the heat treatment (the boiling for 15 min.) the microorganisms were completely destroyed. For finished preparations the identifying of NTG, NTMD was performed within 120 hours for buns and cakes, analyzes were carried out after 24, 72, 120 hours of finishing the technological process and, respectively, 45 days for cookies, the analyzes were performed after 1 15, 30, 45 days after finishing the technological process. Until analysis, the assortment of cakes and buns was packed after finishing the technological process in polythene bags BOPP (tightly packed) and kept in the dark place with a temperature of 18 ± 3 C and relative humidity 70-75%.

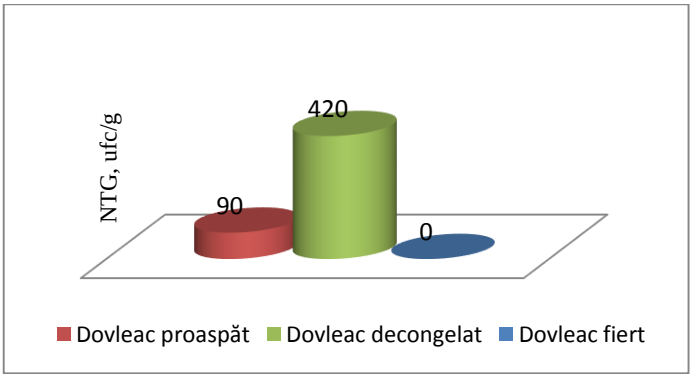


Fig. 3.NTG variation in pumpkin processing

It is observed (Figure 4) that the finishing process technology and up to 24 hours of storage cells intense metabolic activity in preparation for multiplication process. After 72 hours, the bacterial cells begin to multiply being at the endof the lag phase lag. After 120 hours, a significant increase from is observed, in that case the barteriene cells are in log phase (growth).

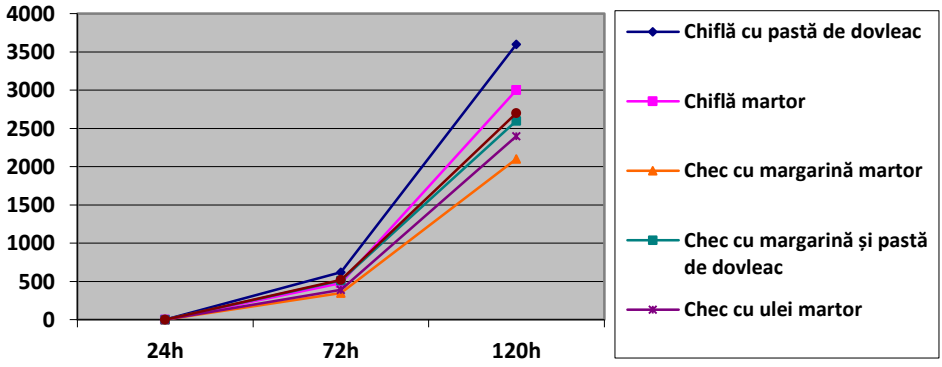


Fig. 4. The evolution of microorganisms in cakes and rolls, Sabouraud nutrient medium

After the obtained results, NTG in the assortment of pastries and cake, we may state, did not exceed the standard. The cookies were kept in the same conditions as in the case-assortment of buns and cakes, cookies have undergone keeping in two packaging (BOPP polythene bags and containers tightly packed). Because no significant difference in moisture between cookies with pumpkin pulp and witness, the growth rate of microbial cells does not vary essentially by product (fig. 5).

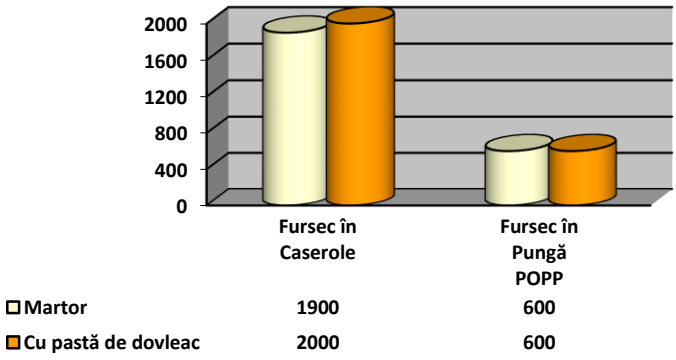


Fig.5.The growth rate of the microbial cells according to the product after 30 days, Sabouraud nutrient medium

A major influence has the packaging of products, thus bagging crucial development POPP reduces microbiota.

Conclusions

For all pastry with the addition of pumpkin pulp is observed peaks recorded for keeping pumpkin. This confirms that the natural compounds present in fresh pumpkin are registered and finished goods.

Assessing the ability of inhibiting the hydrogen peroxide product by adding the pulp of pumpkin conditions digestion gastrointestinal in vitro as compared with the reference standards showed that in all cases the samples with the addition of pulp pumpkin exhibit the ability to inhibit the hydrogen peroxide increased compared to control samples, which confirms the high biological value of these products.

Research raw material used in the preparation of facultative pathogenic microorganisms showed lack and aerobic detected in standard limits are destroyed during heat treatment. Analysis of the evolution of microorganisms in finished preparations demonstrated that the terms of storage are recommended 5 days buns, cakes and biscuit to 45zile. Hermetic packaging bags BOPP polypropylene (for bakers), and keeping in optimal conditions, allowed halting development speed of microbial cells and allows the extension of storage.

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