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The perspective of the use of biologically active substances of grapes in the production of bread products

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Abstract: A study is conducted about the active transference of phenols, tannins and antioxidants in bread that was enriched with grape pips flour and Rkatsiteli wine. After adding 20 ml of Rkatsiteli, the total number of phenols was 228 mg/l, after adding 30 ml - 315 mg/l the number of tannins was 74.45 mg/l and 82.71 mg/l, and the antioxidant activity was 43.41% and 57.78%. In the mentioned samples, the effect of adding wine made it clear that wine pattern was changed organoleptically more in taste, smell, and color than in the number of chemical parameters transferred from the wine. However, it should be noted that the transfer of phenolic compounds from wine to bread has added antioxidant nutritional and distinct technological, organoleptic value to the product. The phenolic compounds transferred from Rkatsiteli wine to the bread, together with other biologically active substances contained in the bread can be determined as the high biological activity of the bread and at the same time, its functional purpose can be considered as curative-prophylactic and preventive material.
Keywords: Grape pips flour -1, Rkatsiteli - 2, Phenolic compounds - 3, Bread - 4, Biological activity - 5.

1. Introduction

The quality of food is believed to be one of the most important and prominent issue in all epochs. Food is the main recourse for the human body to supply with all the necessary nutrients or other biologically active components. According to the theory of balanced nutrition, for normal functioning of the human body, it is necessary to receive not only proteins, fats and carbohydrates, but also substances such as essential amino acids, vitamins, minerals and a whole arsenal of other biologically active natural substances, which are needed in the amount of just micrograms. Without these nutrients, human longevity and health cannot be maintained for a long time. Along with all this, I think it is very important to perceive flavors and its impact on our sensory system and, no less important, on our emotions. An well-known chef claimed:" There is no perfect food without mixture of a beautiful myth."

In the modern stressful and pandemic period, scientists and entrepreneurs worldwide have faced a global task - natural requirements of the human body to be fullfilled with highest quality, biologically rich and safe food nurtients. That created a new concept - the direction of functional nutrition. World Health Organization stated that - about 75% of deaths in the world is caused by the cardiovascular diseases and cancer. Considering the need to prevent such perfidious diseases,

identification of new sources of biologically valuable food products should be introduced in the food industry.

The problem of the new COVID-19 infection once again confirmed that the actual direction of the 21st century is the use of natural biologically active compounds and, based on them, the development of the advanced technology for the production of food products with therapeutic and preventive action.

Our ancestors said - bread comes from Kartli, wine - from Kakheti, cheese - from Tusheti, Erbo - from Pshavi. All these products are important for Georgians not only as food but also have a mystical meaning. Among these products, the most outstanding is the bread of life, because bread is the main product of the human diet, and that is why ensuring the balance of the composition of bread and increasing its nutritional value is a truly relevant and critical issue in modern life.

By adding various natural ingredients to bread and bread products, it is possible to extend the shelf life, improve the texture, obtain a dietary and therapeutic-prophylactic product, and fill in insufficient nutrients in the diet [5,15,16]. As a rule, bread has a wide range of flavors, which allows number of variations, which is therefore an opportunity to be the recipient of various natural, healthy components and become a functional food product. Scientists have studied the amount of phenolic compounds and antioxidant activity in bread enriched with fruits and vegetables. It was confirmed that the total amount of phenolic substances and the indicator of antioxidant activity [1, 3] increased significantly in this bread. Scientific studies have confirmed that bread enriched with cheese is a source of sodium, copper and zinc, and high content of calcium, phosphorus and magnesium has also been recorded [9]. Scientists have studied the positive effect of winemaking residue, namely dried squeezed grape pomace powder which was taken after the end of alcoholic fermentation, on such functional properties of bread such as texture, sensory and physico-chemical indicators. It has been established that squeezed grape pomace powder is an important enriching ingredient in bread production, as it increases the amount of dietary fiber, antioxidant activity and phenolic compounds in the final product [11]. The results of the research of the group of scientists showed that the enrichment of pasta with grape processing residue increases the antioxidant activity of the final product, the number of phenolic compounds, the glycemic index reduction and the improvement of technological and sensory indicators [14].

Scientific studies have proven that phenolic compounds have very strong antioxidant [7,17,19,22,31,32,33,36], antimicrobial [20,38], antiviral [39], antidepressant [34] anticarcinogenic, [18,21,26,27,28,29,35,40], antimutagenic [23] effects and diverse directions of biological activity that have a positive effect on human health [2, 23, 24, 25, 30,37,40]. Recent studies have shown that phenolic compounds are effective against Covid 19 as an additional resource in the treatment of Covid acute and post-Covid period [10, 41].

Biologically active substances are found in juice and even in pomace of the grape, that represents a rich raw material for their high antioxidant and other biological activities. Phenolic substances play an important role in shaping the therapeutic and prophylactic value of the target product. They are represented by flavonoid (oligomeric and polymeric procyanidins, catechins, flavonols, anthocyanins) and non-flavonoid (phenolic acids, stilbenoids, etc.) groups. It should be noted that grape phenolic substances are characterized by high biological activity in various directions, and their content in wines and other products of grape origin determines the functional purpose of these products in terms of therapeutic and preventive properties [4,13,12]. Scientists have experimentally determined that products with a total composition of polyphenols are characterized by synergism of antioxidant activity [6].

On the base of above mentioned issues draws to prove that it is relevant and essential to use grape components during bread production. The aim of the research was to investigate some phenolic substances passed into the bread enriched with Rkatsiteli wine and grape pipes.

2. Materials and Methods

The following were used as research objects:

- Control sample (I)
- - Bread enriched with grape pips flour (II)
- Bread enriched with Rkatsiteli wine and grape pips flour (III)
- Rkatsiteli wine.

Research samples were prepared on the basis of "Mzetamize - Gemovani Puri" LLC. The first sample was made as a control, the second one was enriched with grape pips flour, and the third was made with the addition of Rkatsiteli wine and grape pips flour. All simples - control and experimental simples, were made in compliance with the sequence of technological operations and execution mode adopted at the enterprise.

Total phenols of Rkatsiteli wine used in bread baking were determined.

Total phenols in the skin and heart of the research simples were determined according to the Gloria method [8], a spectrophotometer (HACH / DR / 3900) at 420 and 520 nm wavelengths (Table 3). In order to detect grape pip tannins, their amount was determined at a wavelength of 280 nm in sodium bisulfite or aqueous test samples of model solutions with different (3.2-1.0) pH.

From both Simples, we took 100-100g of bread heart and skin and centrifuged for 2 minutes to obtain a homogenous mass. From the obtained mass, we took 25 - 25 ml of liquid in two copies. To each sample of these analytical liquids, separately, equal amounts of 1:1 model (buffer) solutions with different pH - 3.2 and pH - 1.0 were mixed.

Model solutions were prepared as follows:

1) model solution pH = 3.2 - dissolve 5 g of tartaric acid in one liter of water and add 22.2 ml of 1N NaOH.

2) Model solution pH = 1.0 – presented as 0.1N HCL solution. We measured the hydrogen concentration of both analytical liquids on a pH meter.

We took 0.5 ml of the analytical liquid from each filtrate, diluted it with 100 ml of distilled water and measured the content of total phenols at a wavelength of 280 nm of the spectrophotometer (***Abs*** – total amount of absorbed phenolic compounds at 280 nm).

Then we took two chemical beakers, in which we transferred 0.5 milliliters of each filtrate (pH - 3.2 and pH -1.0) and added 0.5 ml of 0.1% ethanol-hydrochloric acid (1 ml of 0.1N HCL dissolved in 100 ml of 99.6% ethanol) 69 solution. 10 - 10 ml of 2% HCL solution was also added to both types of control mixtures. After that, we took 2.5-2.5 ml analytical solutions from the filtrates of both species (pH - 3.2 and pH - 1.0). We added 1 ml of distilled water (W) to one of them, and 1 ml of 15% sodium bisulfite solution (Na) to the other, and divided the samples as follows: pH W - 1.0 (water); pH Na - 1.0 (sodium bisulfite); pH W - 3.2 (water); pH Na - 3.2 (sodium bisulfite).

Antioxidant activity was determined by the DPPH [2,2-diphenyl-1-picrylhydrazyl (C18H12N5O6, M = 394.33) method. The standard ethanolic solution of DPPH (5× 10-4M), acidified with acetic acid, was diluted 1:10 in ethanol to obtain a working solution. The optical density of the working fluid should not exceed 0.9 when measured at 517 nm.

Picture 1 – Control samples

50 µl of the test solution was added to 5 ml of the freshly prepared working solution, incubated for 30 min at room temperature and measured on a spectrophotometer at a wavelength of 517 nm. For

comparison, we used DPPH working solution (pic 1), and the background was 96% ethyl alcohol [42].

3. Results, Discussion and Conclusion

In the control and experimental Simples of bread, organoletic parameters were determined, including: color, smell, taste and aroma, surface, the appearance of the crumb, porosity. The results of the study are described in Table 1.

Table 1. Organoleptic indicators of control and research samples of bread

Quality indicators	Research Results		
	Control sample I	study sample	
		Bread enriched with grape seed flour II	Bread enriched with Rkatsiteli wine and grape seed flour III
surface	With slight unevenness, without cracks and splits, uniformly colored bark	uniform, views and without cracks, with uniformly colored bark.	Straight, uniform, cracks and without cracks, with uniformly colored bark.
the face of the fragment	Well-baked, cross-section shows no traces of kneaded dough, thin-walled, with equal porosity, without voids.	Well baked, cut across No traces of kneading dough are fixed, thin-walled, with equal porosity and without voids	Well baked, cut across No traces of kneading dough are fixed, thin-walled, with porosity and without voids.
color	Brownish-creamy	Light brown	Brownish, wine-colored
porosity	Well-baked, with thin walls, the core of the bread is porous, elastic, after lightly pressing it with a finger, it takes its initial shape. It does not leave a feeling of stickiness or moisture when touched by hand.	With thin walls, the heart of the bread is porous, elastic, easily recovers its shape when lying down. It does not leave a feeling of stickiness or moisture when touched by hand.	With thin walls, the heart of the bread is porous, elastic, easily recovers its shape when lying down. It does not leave a sticky feeling when touched by hand. It is moderately humid.
the smell	Pronounced aroma of bread, very light, harmonious sour smell.	With a very light scent of Rkatsiteli and a harmonious smell.	With a specific, light scent and harmonious smell of Rkatsiteli.
taste and aroma	With a distinct wheat aroma characteristic of baked bread, with a light sour taste	With a pronounced wheat taste characteristic of baked bread, very light, with a pleasant Rkatsiteli aroma.	With a pronounced wheat taste characteristic of baked bread, light, Pleasant, harmonious aroma of Rkatsiteli.

Table 2. Total phenols, tannins and antioxidant activity in bread enriched with grape seed flour and buckwheat flour

Name	common phenols (mg/l)	tannins (mg/l) 605 nm	antioxidant Activity with DPPH 517 nm (%)	Organoleptics
Rkatsite wine	257.7	_		characteristic variety aroma
100 gr Flour , natural Flour ,				

salt , water (without additional ingredients)	-	-	-	typical
100 gr flour , 5 g (5%) of grapes of pods Flour , natural yeast , water, salt	-	-	-	highlighted aroma and taste Without , pleasant
100 gr flour , 7 g (7%) of grapes of pods Flour , natural Yeast , salt , water	12			highlighted aroma and the taste
100 gr flour , 5 g (5%) of grapes of pods Flour , natural yeast, salt, Rkatsiteli (20 ml), water (40 ml)	228	74,45	43 , 41	Pleasant varietal aroma characteristic of Rkatsiteli and white wine
100 g flour, 5 g (5%) grape seed flour, natural yeast Salt, Rkatsiteli (30 ml, water 30 ml), salt.	315	82, 71	57,78	Sharp varietal aroma characteristic of Rkatsiteli and white wine

Analysis of research Simples made is clear that a successful strategy to improve the antioxidant and health properties of bread is to use small doses of wine to develop certain sensory characteristics, including texture, color and aroma. When adding 20 ml of wine, a small, but cool pleasant aroma of Rkatsiteli was felt in the bread sample, the heart of the bread was characterized by a light brown color; In the mentioned pattern, the amount of total phenols was 228 mg/l, tannins 74.45 mg/l, and the antioxidant effect was recorded with a content of 43.41%. As for the added sample of 30 ml of Rkatsiteli wine, it revealed Rkatsiteli varietal aroma and clearly noticeable light, brownish color, pleasant taste and moderate humidity. The amount of total phenols in the mentioned pattern was 315 mg/l, the amount of tannins was 82.7 1 mg/l, and the antioxidant effect was observed with a content of 57.78% (Table 2).

In the mentioned Simples, the effect of wine addition was reflected organoleptically more in the taste and smell than in the amount of chemical parameters transferred from the wine, as well as the addition of wine increased the content of tannins in the bread and highlighted its antioxidant effect.

The taste and smell of the bread baked with Rkatsiteli wine was characterized by the taste and aroma characteristic of Rkatsiteli grapes, That’s why all the tasters' evaluations recorded that "the bread had a clear effect of white wine on the taste and smell".

Therefore, it can be trustfully said that the transfer of phenolic compounds from grape seed flour and Rkatsiteli wine to bread has added antioxidant nutritional value and distinct technological and organoleptic effects.

Taking into account all above observed and discussed issues, we consider the importance of its further study in near future.

Thus, based on the results of the research, we can conclude that it is appropriate to use Rkatsiteli wine to increase the nutritional value of bread, to improve the quality of finished products, to improve taste properties and to expand the assortment of bread. Bread with Saperavi is a wonderful combination, which complements not only with taste, but also the useful substances included in the product made from different natural ingredients together determine the high nutritional value of the final product. The phenolic compounds transferred from the Saperavi wine to the bread, along with other biologically active substances contained in the bread, determine the high biological activity of the bread and, accordingly, its functional purpose from a curative-prophylactic and preventive point of view.

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