

The Potential of using Georgian Wine and Dried Prune in the Production of Bakery Products

Lali Elanidze^{1*} and Galina Khomych²

¹Doctor of Food Technology, Associative Professor, Faculty of Agricultural, Natural Sciences and Technologies, Iakob Gogebashvili Telavi State University, Telavi, Georgia

²Doctor of technical science, Professor, Head of the Department of Food Production Technologies and Restaurant Business, University of Economics and Trade, Poltava, Ukraine

ABSTRACT

A study was conducted on bread enriched with grape seed flour and Saperavi* wine to determine the total phenolics and anthocyanins transferred. Additionally, the physical-chemical parameters of bread baked using standard technology and bread enriched with dried prunes were evaluated and the organoleptic properties of the ready-made product were studied. Adding 20 ml of Saperavi wine resulted in a total phenolic content of 52 mg/l, with no detected anthocyanins. When 30 ml of Saperavi wine was added, the total phenolic content reached 103 mg/l, and the anthocyanin content was 15 mg/l. The effect of wine addition in these samples was more pronounced organoleptically in terms of taste, aroma, and color rather than in the number of chemical parameters transferred from the wine. However, it should be noted that the transfer of phenolic compounds from the wine to the bread imparted antioxidant nutritional value and distinct technological and organoleptic qualities to the product. Determining the physical-chemical parameters and studying the organoleptic properties of bread enriched with dried prunes showed that the use of prunes affects the acidity, moisture, and porosity of the bread crumb, as well as the protein, fat, and carbohydrate content and the energy value of the final product. Phenolic compounds transferred from Saperavi wine to the bread, along with biologically active nutrients from dried prunes, contribute to the high biological activity of the bread. Therefore, the bread has functional significance for therapeutic-prophylactic and preventive purposes.

*Corresponding author

Lali Elanidze, Doctor of Food Technology, Associative Professor, Faculty of Agricultural, Natural Sciences and Technologies, Iakob Gogebashvili Telavi State University, Telavi, Georgia.

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*Saperavi (*Vitis vinifera*) is a native Georgian red grape variety from Kakheti used for winemaking.

The quality of food has always held one of the most important and distinguished places throughout all eras. Through food, the human body receives all necessary nutrients and other biologically active components. According to the theory of balanced nutrition, for the normal functioning of the human body within physiological limits, it is necessary not only to receive proteins, fats, and carbohydrates but also essential substances such as essential amino acids, vitamins, minerals, and a whole arsenal of other biologically active natural substances. Although these nutrients are needed in mere microgram amounts, without them, it is impossible to sustain human longevity and health. Additionally, I believe it is very important to consider the perception of taste and its impact on our sensory system, and equally importantly, on our emotions - a famous chef once said, "No food is perfect unless seasoned with a beautiful myth" [1].

In this modern, stressful, and pandemic era, the global task for

scientists and entrepreneurs worldwide has become to meet the physiological needs of the human body with the highest quality, biologically complete, and safe food products. This has led to the birth of a new concept – the direction of functional nutrition. According to the World Health Organization, approximately 75% of deaths globally are due to cardiovascular diseases and cancer, which are the leading causes. Considering the necessity to prevent such insidious diseases, the food industry must introduce new sources of biologically valuable food products.

The issue 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 latest technology for producing food products with therapeutic and prophylactic effects [1].

Our ancestors said, "The bread of Kartli, the wine of Kakheti, the cheese of Tusheti, and the butter of Pshavi." All these products are important to Georgians not only as food but also hold sacral significance. Among these, bread is particularly distinguished as our sustenance because bread is a main product in the human diet. Therefore, ensuring the balance of bread composition and increasing its nutritional value is relevant and important in modern life.

By adding various natural ingredients to bread products, it is possible to extend the storage of bread, improve its texture, obtain dietary and therapeutic-prophylactic products, and also fill the deficit of insufficient nutrients in the diet. Typically, bread has a wide range of flavors, allowing for many variations, which provides an opportunity to incorporate various natural, healthy components and turn them into functional food. Researchers 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 significantly increased in such bread. Scientific research has confirmed that bread enriched with cheese is a source of sodium, copper, and zinc, and also has a high content of calcium, phosphorus, and magnesium. Researchers have studied the positive impact of winemaking waste, specifically dried grape pomace taken after the completion of alcoholic fermentation, on the functional properties of bread such as texture, sensory, and physical-chemical parameters. It was determined that grape pomace is an important enriching ingredient in bread production because it increases the amount of dietary fiber, antioxidant activity, and phenolic compounds in the final product. Scientific research has confirmed that phenolic compounds have very strong antioxidant, antibacterial, and antiviral effects, and various directions of biological activity. Recent studies have shown that phenolic compounds are effective in the fight against COVID-19, serving as an additional means in the treatment of COVID-19 patients, both during the acute period and post-Covid syndrome [2-7].

Biologically active substances found in grape juice and grape solid parts are rich raw materials due to their high antioxidant and other biological activities. Phenolic substances play an important role in forming the therapeutic and prophylactic value of the target product. They are represented by flavonoid (oligomeric and polymeric procyanidins, catechins, flavonols, and anthocyanins) and non-flavonoid (phenolic acids, stilbenoids, etc.) groups. It is noteworthy that grape phenolic substances are characterized by high biological activity in various directions, and their content in wines and other grape-derived products determines the functional purpose of these products in terms of therapeutic and prophylactic properties. Experimental studies by scientists have shown that products with a total polyphenol content are characterized by synergism of antioxidant activity [8-11].

The organoleptic value of bread depends on its appearance, crumb condition, taste, aroma, and largely determines its nutritional value. The amount of flavor and aromatic substances in bread mainly depends on the type and kind of flour, the recipe, the specifics of dough preparation, the addition of various natural additives, as well as the baking duration. The most popular biologically active natural additives are those that help produce bread products with improved quality indicators and increased nutritional value. One component that can enrich bread with biologically active substances is dried prunes [12,13].

Dried prunes are a rare fruit that retains its beneficial properties and chemical composition even when dried (Table 1). They are rich in vitamins A, K, B2, B3, B6, C, potassium, magnesium, phosphorus, and iron. Dried prunes strengthen the immune system, are an excellent remedy for regulating the gastrointestinal tract, have antibacterial and anti-atherosclerotic effects, and improve heart muscle function, blood circulation, and metabolism. They

positively influence the brain, nervous system, and muscle function. Scientific research has confirmed the importance of dried prunes in the prevention of oncological diseases and their antioxidant activity [6,14-19].

Table 1: The Nutrition Value of the Dried Prune in 100 G Product

Product	Proteins g	Fats g	Carbohydrates g	Dietary Fibres	Energetic value kkl
Dried prune	0,96	0,16	28,08	3,1	107

Based on the aforementioned, we can conclude that the use of grape components and dried prunes is relevant and important in bread production. Therefore, the goal of this study was to investigate certain phenolic substances transferred into bread enriched with Saperavi wine and grape seed flour, as well as to determine the physical-chemical parameters of bread baked using standard technology and bread enriched with dried prunes and study the organoleptic properties of the final product.

Research Objectives and Methods

The research objects used are as follows:

1. - Control sample (I)
- Bread enriched with grape seed flour (II)
- Bread enriched with Saperavi wine and grape seed flour (III)
- Saperavi wine
2. - Bread baked using standard technology (I)
- Bread enriched with dried prunes (II)

The research samples were prepared at the base of Ltd/LLC "Mzetamze - Tasteful Bread." All samples – both control and research samples – were made following the technological operations sequence and execution regime adopted at the enterprise.

The total phenolics and anthocyanins of Saperavi wine used in baking bread were determined (Table 3). The organoleptic parameters of the control and research bread samples were evaluated, including color, smell, taste, aroma, surface, condition of the piece of the bread, and porosity. The research results are presented in Table 2. The total phenolics and anthocyanins transferred into bread enriched with Saperavi wine and grape seed flour were determined (Table 3). The nutritional value of dried prunes was determined, and the external appearance, shape, surface, crumb condition, smell, and taste of bread baked using standard technology and bread enriched with dried prunes were evaluated. The research results are presented in Table 4. Additionally, the physical-chemical parameters of bread baked using standard technology and bread enriched with dried prunes were determined (Table 5).

The total phenolics and free anthocyanins in the crust and crumb of the research samples were determined according to the Gloria method, using a spectrophotometer (HACH / DR / 3900) at wavelengths of 420 and 520 nm (Table 3). To detect grape seed tannins, their amount was determined at a wavelength of 280 nm in model solutions with various (3.2-1.0) pH sodium bisulfite or aqueous test samples [20].

Results and their Analysis

Table 2: Organoleptic Indicators of Control and Experimental Bread Samples

Indicators of quality	Research results		
			Research sample
	Control sample I	Bread Enriched with Grape Seed Flour II	Bread Enriched with Saperavi and Grape Seed Flour III
Surface	With minor irregularities, without cracks and fractures, uniformly colored crust.	Uniform, without cracks and fractures, with a uniformly colored crust.	Straight, uniform, without cracks and fractures, with a uniformly colored crust.
Fracture Appearance	Well-baked, with no signs of under-kneaded dough in the cross-section, thin-walled, with uniform porosity, without voids.	Well-baked, with no signs of under-kneaded dough in the cross-section, thin-walled, with uniform porosity, and free of voids.	Well-baked, with no signs of under-kneaded dough in the cross-section, tender, porous, and free of voids.
Color	Light brownish-cream	Light brown	Brown, reddish, with a wine-colored tint
Porosity	Well-baked, with thin walls, the crumb is porous and elastic, regaining its original shape after a light press with a finger. It does not feel sticky or moist to the touch.	The crumb is porous and elastic with thin walls, easily regaining its shape when pressed. It does not feel sticky or moist when touched.	The crumb is porous and elastic with thin walls, easily regaining its shape when pressed. It does not feel sticky to the touch. It is moderately moist.
Odor	With a Well-defined bread aroma and a very light, harmonious sour smell.	With a very light Saperavi aroma and a harmonious scent.	With a specific, light Saperavi aroma and a harmonious sour scent.
Taste and aroma	With a well-defined wheat aroma characteristic of whole grain bread and a light sour taste.	With a pronounced wheat flavor characteristic of whole grain bread and a very light Saperavi aroma.	With a well-defined wheat flavor characteristic of whole grain bread, and a light, harmonious Saperavi aroma.

Table 3: Total Phenols and Anthocyanins are Transferred into Bread Enriched with Saperavi and Grape Seed Flour Anthocyanins

Name	Total phenols (mg/l)	anthocyanins (mg/l)	Organoleptic properties
Saperavi wine	3335,5	402	Characteristic varietal aroma
100g flour, natural yeast, salt, water (no additional ingredients)	-	-	Typical
100g flour, 5g (5%) grape seed flour, natural yeast, water, salt	-	-	Without a well-defined aroma and taste, pleasant
100g flour, 7g (7%) grape seed flour, natural yeast, salt, water	12	-	Without a well-defined aroma and taste, pleasant
100g flour, 5g (5%) grape seed flour, natural yeast, salt, Saperavi (20ml), water (40ml)	52	-	A slight tone of Saperavi
100g flour, 5g (5%) grape seed flour, natural yeast, salt, Saperavi (30ml), water (30ml), salt	103	15	A well-defined Saperavi aroma and a noticeable red color

Table 4: Organoleptic Characteristics of Standard Bread and Bread Enriched with Dried

Indicators	Results	
	Brea baked with standard technology	Bread enriched with dried prune
Form, color	Corresponds to the shape of the bread in which it was baked. Glossy surface with a light brown color	Corresponds to the shape of the bread in which it was baked. Light brown color.
Surface	Uniform, without cracks or fissures. The top crust is slightly bulging.	Minor irregularities, with pieces of dried prunes on the surface.
Bread crumb condition	Well-baked, and elastic, it returns to its original shape after light pressure with a finger. No sensation of stickiness or moisture when touched by hand. No voids or hardened parts, thin walled with a porous structure.	It was Baked, properly dried, without voids or hardened parts, with pieces of dried prunes embedded
Scent and taste	Characteristic bread aroma and flavor, without any foreign smell or taste.	Characteristic bread aroma with hints of dried prunes, without any foreign smell or taste.

Table 5: Physico-Chemical Indicators of Standard Bread and Bread Enriched with Dried Prunes

Indicators	Results	
	Bread bakes with a standard technology	Bread enriched with dried prune
Porosity of the bread crumb, %	42,1	44,0
Acidity and degree of the breadcrumb	4, 8	5,67
porosity, %	72	69,2
Proteins,%	7,5	6,49
fats, %	1,3	1,12
carbohydrates,%	45,2	42,5
Energetic value, kcal	227	239,1

The analysis of the research samples showed that the use of small doses of wine is a successful strategy for improving the antioxidant and health properties of bread, specifically in terms of the development of certain sensory characteristics, including texture, color, and smell. When 20 ml of Saperavi wine was added, the bread sample exhibited a slight but pleasant aroma of Saperavi, and the crumb was light reddish. The total phenolic content in this sample was 52 mg/L. As for the sample with 30 ml of Saperavi wine, it revealed a distinct varietal aroma of Saperavi, a pronounced purple-reddish color, a pleasant taste, and slightly increased moisture. The total phenolic content in this sample was 103 mg/L, while the anthocyanin content was 15 mg/L (Table 3).

In these samples, the effect of adding wine was more pronounced organoleptically in terms of taste, smell, and color than in the quantitative chemical parameters transferred from the wine. However, it can be confidently stated that the transfer of anthocyanins from Saperavi wine into bread added antioxidant nutritional value and notable technological merits. The taste and aroma of the bread baked with Saperavi wine were characterized by the distinctive varietal aroma of Saperavi grapes, with flavor and aromatic properties noted by all tasters, who recorded that “the bread had a pronounced effect of Saperavi wine on its taste and smell.”

The organoleptic evaluation and chemical composition study of standard bread and bread enriched with dried prunes showed that the external appearance of the bread enriched with dried prunes featured prune pieces embedded in the surface was adequately dried, and free of voids and hardened spots. The crumb also had prune pieces embedded, with a characteristic bread smell and light, balanced tones of dried prunes, without any foreign smell or taste. The chemical composition study results of the standard bread and bread enriched with dried prunes indicated that the use of prunes influenced the crumb’s acidity, moisture, and porosity, as well as the protein, fat, and carbohydrate content, and the final product’s energy value.

Considering all the above, it seems advisable to further study the effect of these additives on the bread’s long storage and nutritional value.

Thus, based on the research results, we can conclude that it is advisable to use Saperavi wine and dried prunes to increase the nutritional value of bread, improve the quality of the final product, refine taste characteristics, and expand the bread assortment. Bread with Saperavi and dried prunes represent an excellent

combination that complements each other not only in terms of taste characteristics but also with the beneficial substances contained in the product prepared from various natural ingredients, leading to a high nutritional value of the final product. The phenolic compounds and other biologically active nutrients transferred from Saperavi wine and dried prunes into the bread, along with other biologically active substances present in the bread, result in high biological activity and, consequently, functional use from a therapeutic, prophylactic, and preventive perspective.

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