Comparative study concerning the use of tomato juice added to food products of animal origin

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Abstract

In the food processing industry, tomato is a basic vegetable ingredient, widely used in many products such as juices, soups, sauces and ketchups. Increasing market demand for fast food products often served with many tomato sauces has encouraged tomato processing industry. A widely product used in all countries due to its nutritional, stimulating qualities is given by bolognese sauce. The purpose of this paper was to carry out a study on the nutritional and sensorial values for some varieties of Bolognese sauces commercialized in Timisoara supermarkets, compared with two tomato sauces: sauces with meat (mixture of beef and pork) and sauces with vegetables, prepared according to the own recipe. Bolognese sauce (Ragu) is a culinary dish dating back to the 18th century, originating in northern Italy, in the Bologna city, as it is also called. In Bologna, the sauce requires a thin beef fillet, combined with pancetta, butter, onion and carrot. The following parameters were highlighted: energy value, total fat content, carbohydrates, proteins, dietary fiber. Also, the sensory analysis of the two varieties of sauces experimentally obtained, was performed. Nutritional values of commercialized sauces, used in this study were taken from the labels mentioned by the companies producing of these assortments. The nutritional values of the experimentally obtained sauces were calculated using the nutritional values of each ingredient that is part of them, taken from the Frida fooddata.dk database. Due to its beneficial properties, giving many nutrients, Bolognese sauces are part of the class foods recommended to be consumed by people of all ages. In human nutrition, is required because it has a high relative nutritional and sensorial values, a pleasant taste and aroma

Keywords: tomato juice, varieties of Bolognese sauces, nutritional values
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1.Introduction

The tomato, a member of the Solanaceae family was not generally accepted as a vegetable food until the middle of the 19th century. Tomato (*Solanum lycopersicum*) is a plant of the Solanaceae family being introduced in Europe by the spaniards from South America in the middle of the sixteenth century [1,2].

Tomato, is a perennial plant growing in areas with temperate climates across the word being originate in Central and South America extending from Mexico to Peru. In their native habitat, they are cultivated as annuals plant which grows on the stems of other plants, on sticks and fences like any climbing plant. It generally reaches between 1 and 3 m in height. In 2001 the European Union decided officially that the tomato is botanically a fruit, not vegetable [3,4].

Tomato is, without a doubt, a highly valuable nutritional food. Tomatoes are some of the most consumed foods in the world can be easily used in various ways, raw or cooked in many dishes, sauces, salads and juices [5,6].

Chemical composition of tomato contains on average: 94% water, 0.6% mineral salts, 5.4% organic substances and many vitamins. Moreover, tomatoes contain 1% protein, 3.4% sugars, 0.27% cellulose, 0.35% acids, 0.15% fat, 0.13% pectin, 0.07% glycosides, 0.03% starch. The energy value of tomatoes is relatively low, being between 22 and 26 calories/100g confirmed by its chemical composition [7,8]. However, they are an excellent sources of antioxidants, fiber, minerals and vitamins.

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Tomatoes contain A, B1, B2, B5, B6, C, E, K vitamins and also calcium, sodium, magnesium, phosphorus, potassium, iron and lycopene. Lycopene, an antioxidant in the flavonoid class, is present in tomatoes, also, phytonutrients as beta, alpha carotenoids, zeaxantin and lutein [9,10].

Tomato juice is widely used by people, representing an energizing, refreshing and detoxifying drink. The juice made from tomatoes, is used usually, simply or as a beverage in cocktails such as Bloody Mary, Caesar or Michelada. In the food processing industry most tomato juices are obtained from tomato paste. Tomato juice is often used as a liquid for packaging canned tomatoes, but is sometimes replaced with tomato puree for international trade due to tariff issues for vegetables and sauces [11].

Tomato paste is a thick paste that is obtained by cooking tomatoes for several hours to reduce water content, removing seeds and skin. Cooking takes place to reduce the liquid base to one more concentrated. Through the manufacturing conditions, tomato paste may be a base for making ketchup or tomato juice [12, 13].

A favorite product used in all countries due to its nutritional, stimulating qualities is given by **tomato sauces.** The sauce is viscous or a liquid culinary preparation, which is made up of a mixture of ingredients, used for cooking and serving of other food products. Bolognese sauce (Ragu) is a sauce dating from the eighteenth century, originating in northern Italy, in the city of Bologna, as it is called. The sauce is used for pasta and to prepare lasagna alla bolognese. The recipe used now differs slightly from the original and there are many variations, but the established recipe is given in October 1982. Nowadays, there are many variations of the recipe, even among local Italian chefs, and the repertoire has been further expanded by some American chefs, who were known for their expertise in Italian cuisine [14,15,16]. Food quality assessment is an important aspect of the development of marketing products. Sensory analysis of food by the consumer include testing of the characteristics relating to appearance, taste, color, odor, texture by using a scale of values [17,18].

2. Material and Methods

The aim of this paper was to obtain a study on the nutritional and sensorial values for some varieties of Bolognese sauces commercialized in Timisoara supermarkets, compared with two tomato sauces:

sauces with meat (mixture of beef and pork) and sauces with vegetables, prepared according to our own recipe.

From Timşoara supermarkets the following five type of bolognese sauce products were purchased: Panzani sauce bolognese classique, Dolmio intense bolognese sauce, K-classic bolognese sauce with tomatoes and minced beef, Combino vegetarian tomato sauce with soy strips, Barilla tomato sauce with beef and pork.

The following parameters were highlighted: energy value, total fat content, carbohydrates, proteins, dietary fiber. The nutritional values of the sauces sold, used in this study were taken from the labels mentioned by the companies producing these assortments.

The nutritional values of the experimentally obtained sauces were calculated using the nutritional values of each ingredient that is part of them, taken from the Frida fooddata.dk database [19]. In addition, the sensory analysis of the two assortments of sauces obtained experimentally was performed. In addition, the sensory analysis of the two varieties of sauces experimentally obtained was performed.

The Bolognese sauces obtained experimentally after own recipe are the following: Bolognese sauce with beef and pork (SBC) with a higher energy value, rich in calories, and a Bolognese sauce with vegetables (SBL), vegan type, recommended for vegetarians, used by persons with dietary food [20, 21].

Recipe used to prepare Bolognese sauce with beef and pork (Homemade Sample 1, SBC): 350 g fatter beef, 150 g pancetta (pork breast), 1 carrot, 1 onion, 1-2 celery sticks, 3 medium tomatoes, 200 ml tomato juice, 2–3 tablespoons olive oil, 50 g butter, 100 ml milk, one liter of hot water, salt, pepper.

Recipe used to prepare Bolognese sauce with vegetables (Homemade Sample 2, SBL):3 carrots, 1 leek, 2 pieces of garlic, 1 hot pepper, 1-2 celery sticks, 1 zucchini, 850 ml tomato juice, 3 olive oil tablespoons, 20g sugar, rosemary, parsley, basil, oregano, thyme, salt, pepper.

3. Results and discussions

In this study we have analyzed the nutritional values of commercially Bolognese sauces, as well as homemade sauces.

The ingredients of the homemade bolognese sauce with meat and their weight were listed, then its nutritional values were calculated, obtaining the total values. The energy values of Bolognese sauces were also analyzed.

Table 1. Nutritional values of Bolognese sauce with meat (SBC) and with vegetable (SBL) per 100 g of product [19]

Homemade sauces	Energy (kcal)	Fats (g)	Carbohydrates (g)	Dietary fiber (g)	Protein (g)	Salt (g)
SBC	89.6	6.7	4.2	0.8	4.4	1.4
SBL	86.2	2.86	10.8	3.21	2.9	1.4

Table 2. Nutritional values of Bolognese sauces assortments from Timișoara markets, compared to prepared sauces according to own recipes [19]

Product	Energy (kcal)	Fats (g)	Carbohydrates (g)	Dietary fiber (g)	Protein (g)
Panzani	77	3.1	6.5	1.5	4.9
Dolmio	44	< 0.5	7.9	1.7	1.7
K-classic	87	< 4.8	6.4	0.7	4.2
Combino	57	1	6.3	non	3.8
Barilla	86	4	7.5	1.5	4.2
SBC	89.6	6.7	4.2	0.8	4.4
SBL	86.2	2.86	10.8	3.21	2.9

The comparative values of the two Bolognese sauces with meat and vegetables, obtained according to their own recipes (SBC and SBL) are presented in table 1.

Figure 1. Comparative values of energies (kcal / 100g) of meat sauces (SBC) and vegetables (SBL), prepared according to the homemade recipe

Figure 2. Energy values (kcal / 100g) of SBC and SBL sauces, compared to the energy values of some Bolognese sauces from Timișoara markets

As can be seen from Table 2 and Figure 1, the energy value of the two homemade sauces is close. Significant differences were observed at the total fats content, carbohydrates and dietary fiber. Bolognese sauce prepared with vegetables (SBL) is richer in carbohydrates and dietary fiber.
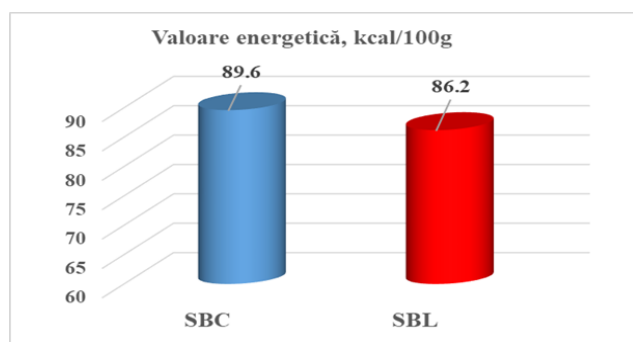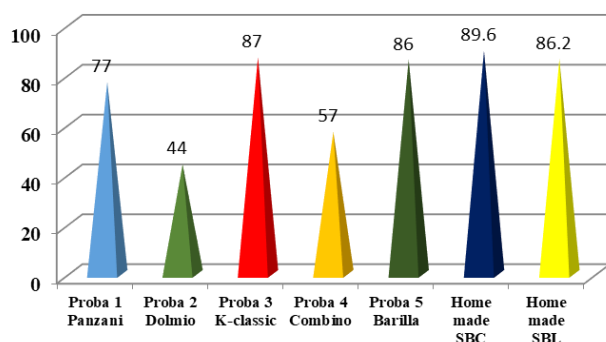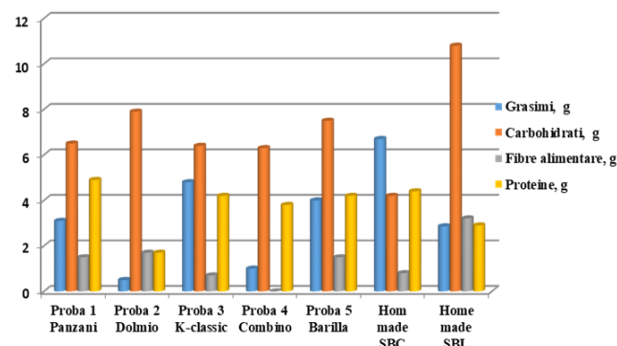

Figure 3. Nutritional values (g / 100g) of homemade SBC and SBL sauces, compared to the nutritional values of some Bolognese sauces purchased from Timișoara markets

The graph shows that the energy value of the homemade sauce prepared with meat, SBC is close to the energy value of the commercial sauces Panzani, Barilla and K-classic. The energy value and the higher caloric intake of SBC sauce, recommends this product in the diet to the older people or for children.

As can be seen from figure 3, the nutritional parameters have different values, depending on the sauce assortments and the considered parameter.

In case of carbohydrates, the richest in the carbohydrates is the Home made SBL sauce (as expected), followed by the other sauces with lower and relatively close contents: Dolmio, Barilla, Panzani, K-classic, Combino and homemade sauce with meat. Regarding the fat content, the highest value was observed in the Home made SBC sauce, as we expected. Lower values are observed, in order for the sauces K-classic, Barilla, Panzani, Homemade SBL, Combino and Dolmio. As for the fiber content, the richest in dietary fiber is the Home made SBL sauce (as expected), followed by lower contents, relatively close (as seen on the graph) by Dolmio, Panzani, Barila, Homemade SBC and K–Class sauces. Different values can also be observed in case of protein content, the richest in protein being Panzani sauce. Homemade, Barilla, K-classic and Combino sauces have lower protein contents and are relatively close. The poorest in protein content are Dolmio and Homemade SBL sauces.

In this study, a sensory analysis was performed between sauces on the Timisoara market, the "PZN" Panzani-type (beef and pork sauce), "CMB" - Combino (vegetable sauce) and homemade sauces, the ''SBC'' - Bolognese sauce with meat (beef and pork) and "SBL "- Bolognese sauce with vegetables. Testing by the consumers of the characteristics related to the appearance, taste, color, smell, texture was achieved by using a scale of values. The scale method with a score of "1-5" was used, where 1 represents unacceptability and 5 represents the maximum acceptability from the consumer for the evaluated characteristic.

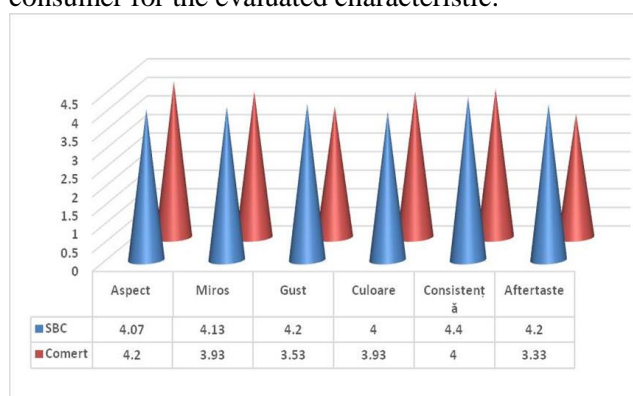|	Aspect	Miros	Gust	Culoare	Consistenț ă	Aftertaste
SBC	4.07	4.13	4.2	4	4.4	4.2
Comert	4.2	3.93	3.53	3.93	4	3.33

Figure 4. Graphic representation of sensory characteristics in case of the Bolognese sauces with meat

Bolognese sauces were sensorially compared by 15 tasters. First, the sauces with beef and pork were sensory compared (homemades with the sauce from Panzani trade) and then the sauces with vegetables (homemades with sauces from the Combino trade) were sensory compared.

Following the sensory analysis performed by the 15 evaluators, the Homemade beef and pork product obtained an average score of 25, and the Panzani sauce obtained an average score of 22.93.

After the sensory analysis performed of the 15 evaluators, Homemade vegetable products obtained an average score of 27.57 compared to the Combino sauce, witch obtained an average score of 21.79.
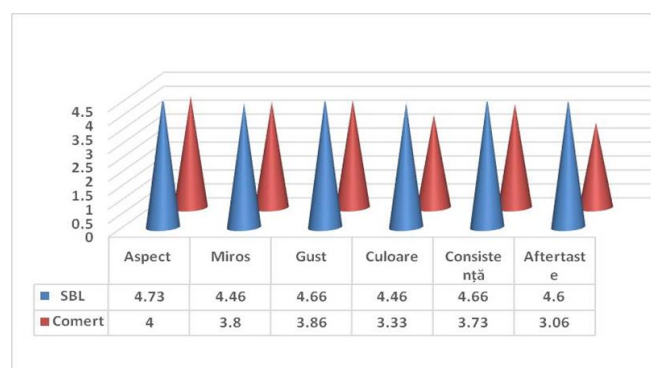

	Aspect	Miros	Gust	Culoare	Consiste nță	Aftertast e
SBL	4.73	4.46	4.66	4.46	4.66	4.6
Comert	4	3.8	3.86	3.33	3.73	3.06

Figure 5. Graphic representation of the sensory characteristics of the Bolognese vegetable sauce

4. Conclusion

Bolognese sauces are part of the foods category consumed by people of all ages, due to their special nutritional and sensory qualities. The nutritional parameters of bolognese sauces have different values, depending on the sauce assortment and the evaluated parameter.

The energy value of two homemade prepared sauces, is close. Significant differences are observed in the total content of fats, carbohydrates and dietary fiber. Bolognese vegetable sauce (SBL) is richer in carbohydrates and dietary fiber.

The energy value of the homemade meat sauce, SBC is close to the energy value of Panzani, Barilla and K-classic commercial sauces. The energy value, respectively the higher caloric intake of SBC sauce, recommends this product in the diet for the elderly or children.

The richest in carbohydrates is the Home made SBL sauce (as expected), followed by the other sauces with lower and relatively close contents: Dolmio, Barilla, Panzani, K-classic, Combino and the home made meat sauce.

Regarding the fat content, the highest value was observed in the Home made SBC sauce (as expected).

Lower values are observed, in order for the sauces K-classic, Barilla, Panzani, Homemade SBL, Combino and Dolmio. The richest in dietary fiber is the Home made SBL sauce (as expected), followed by lower contents, relatively close (as seen on the graph) by Dolmio, Panzani, Barila, Homemade SBC and K–Class sauces.

Analyzing the data obtained from the sensory assessment tests, the appearance, smell, taste, color, consistency and aftertaste was highly valued for homemade prepared sauces. SBL sauce was the most appreciated by tasters in terms of sensory characteristics. Commercial sauces are more appreciated in terms of appearance than those prepared at home.

As a final conclusion, we encourage introduction of Bolognese sauces with vegetables and with meat in the food consumption, especially due to its nutritional, stimulating properties: taste and aroma, as well as for the diversification of consumer preferences.

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