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Increasing the nutritional and functional value of the pastry dough by adding apricot

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Abstract

The main objective of this paper is to increase the assortment of pastry products and the nutritional value of dough pastry by adding apricot in its composition. The obtained product was characterized in terms of sensory and physic-chemical properties, by determining proximate composition (humidity, dry substance, fat, carbohydrates, proteins, and calculating the energy value), the contribution of macro (Mg, K, Ca) and microelements (Fe, Zn, Cu). The nutrient intake was also determined by consumption of 100 g of product based on the Recommended Daily Dose (RDD). The experimental results have shown that the introduction of apricots into the manufacturing recipe leads to an increased of protein and lipid intake, of mineral substances and energy value of the product. Apricots increase functionality of pastry by increasing the intake of Mg, K, Zn, Cu and especially Fe, the product being recommended for ferritic anemia.

Keywords: pastry dough, apricot, physic-chemical properties

1. Introduction

Pastry production is one of the main branches in the food industry. Considering the importance of pastry products in meeting consumers food requirements, food industry has experienced a sustained development over the years, characterized by the application of modern production processes and technologies, the extension of mechanization and automatization of the technological production processes, widening of the assortment by realizing products in accordance with the trends, demands and requirements of the consumers, ensuring the improvement of quality and nutritional value of pastry products [4]. Thus, the current trend is to diversify the products, which correspond in terms of nutrition and sensory consumer demand.

In pastry dough category an important role is to obtain French dough or pastry. The pastry is used in preparation of several types of pastry products (snacks, desserts) including: pies, crackers, triangle, pates, salty, sells, threads, jars, triangles, cookies, pies, baklava, shakes, rounds, rolls, vol-au-vent **[2]**.

Pastry dough (French dough) is originally from France, invented in the 17th century by Claudius Gele, an pastry aid.

Pastry is a dough whose composition comprises two basic components: flour and semi-solid fat. Tenderness and layering dough sheets is provided by using high quality raw materials and compliance with technological phase sequence **[3]**.

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The amount of energy supplied by pastry is completed in this group with organic acids, low-molecular carbohydrates (glucose, fructose) from fruit or vegetables, while at the same time, extra vitamins and minerals. The presence of these chemical components imparts pleasant, refreshing and an easy digestion to the food products. Preparations of this group can easily associate a menu setting at same time also the acid-base balance.

Apricots are some of the most demanded fruits by consumers, both fresh and processed in different products. High demand for these fruits is determined by their quality and technological attributes: smoothness pulp, specific flavor, rich in sugar content, acidity and other useful body substances **[**13**]**.

From the nutritional point of view, apricots represent an important source of minerals and vitamins. The chemical composition of an apricot is given by: 10.6 to 21.71% dry matter, 6 to 15.68% sugars, from 0.34 to 2.61 % total acidity, crude protein, pectins, minerals, K, P, Ca, vitamins A, C, P, E, etc. The energy value is 21 - 77 calories / 100 g. The sanogenic role of apricots derives from beneficial effects on digestion and especially through contribution to hemoglobin formation due to high iron content **[**5**]**.

Apricots are one of the most richest fruits in iron. The iron content of apricots is comparable to green leafy vegetables (spinach, broccoli) and is superior to peaches. Addition of apricot in food meals leads to an increase in iron intake. Apricots also provide an important contribution of copper. Concentration of these microelements in apricot fruits is superior to green leaf matrix **[**12, 14**]**.

Associating apricots in food is a way to increase the range of foods and boost nutritional value.

In this study, the possibilities of using apricots in pastry-making technology are ideas with innovative valences that come to support consumers demands for a diversified diet. The present study proposed: i) to obtain a pastry dough functionally enriched with apricots; ii) to characterize organoleptically and nutritionally by determining the proximate composition (moisture, minerals, proteins, lipids, carbohydrates, energy value), intake of macroelements (K, Ca, Mg) and microelements reference value established for a non-additive product; (iii) determination of nutrient intake relative to the Recommended Daily Dose (RDD).

2. Materials and Methods

Materials

The recipe made for making 20 pieces of apricot strudel weighing 100 g each is the following: 1 kg flour, 0.03 l vinegar, 0.02 kg salt, 0.5 l cold water or ice (roughly depending on the quality of the flour), margarine weigh 35% of the amount of dough **[**2**]**.

Preparation of the pastry. Except for margarine, the rest of ingredients are kneaded with the mixer Esmach ISE 30 for 4 minutes at a speeds of 100 rpm and 6 min at 200 rpm. The dough is spread and the whole surface will be covered with margarine. After that the dough will be rolled and packed 3 times, with half an hour breaks. Final lamination will be about 4-5 mm thick, then portioned to 100 g and put the apricot purée, filling approx. 35 g. Products are placed in trays and baking at 210°C **[**2**]**.

In parallel, a reference sample obtained from the same pastry dough, but without the apricot filling, was also carried out.

Physical-chemical and nutritional characterization of the final product:

The obtained products have been analyzed in terms of physic-chemical and nutritional content by determination of moisture, lipid and ash content [22], proteins [21], minerals (by atomic absorption spectrophotometry [23]) carbohydrates and energy value [17]. The used methods are standardized methods for determining physical and chemical properties of food flour and bakery products.

Carbohydrate content was determined by difference after determining lipid content, proteins, minerals and moisture. Energy value, or calories was calculated by summing caloric intake given by fat, sugars and proteins based on the formula: energy (kcal) = (g lipids x 9) + (g protein x 4) + (g carbohydrates x 4).

Statistical Analysis

All determinations were made three times and the arithmetic avarage was calculated from the obtained value s± standard deviation (SD) and the analysis of variance (ANOVA one-way) using the Microsoft Excel 2010 was performed. The statistical analysis of the obtained data was compared to the reference value for unfilled pastry product type.

3. Results and discussions

The finished product was organoleptically characterized according to SR 91:2007 [22], the obtained data being presented in Table 1. From the obtained results it can be observed that the product corresponds in terms of organoleptic properties to the food consumption requirements.

Table 1. Organoleptic characteristics of the finished product

Characteristic	Description
Form/shape	parallelipipedic with a length of 10-12 cm and width of 5-6 cm
Taste	sweet, characteristic of apricots, no sour or bitter taste, or other unpleasant taste, without scratches in the teeth due to mineral impurities (sand, earth etc.)
Appearance	well-developed product, unruly, unbroken, undistorted
Shell	glossy, unsteady
Colour	brown-gold, ruddy, uniform
Middle	core: pastry with apricot filling visible without compact layers without lumps of flour, structurally peel, without goals, without foreign bodies. Elastic consistency, no breathing. Pleasant aroma without foreign odor (mold, rancid, fuel etc.)

Physico - chemical properties of the finished product

In the physico-chemical analysis of the samples, following admissibility conditions (Table 2) for physic-chemical properties [20] were considered:

Table 2. Admissibility conditions for physic-chemical properties of pastry

Moisture, max. %	43.5
Acidity, max. degrees	2.5
Sugar reported on dry matter, min. %	15
Fat relative to dry matter, min. %	8
Ash, max. %	0.2
NaCl, max%	2

The obtained results regard to the chemical analysis of the pastry with apricot are shown in Figure 1.

The moisture content ($p<0.05$) shown in Figure 1 was 41.3% for apricot pastry compared to 43.5% for the reference sample, the values being within the maximum allowed value according to the standard [20]. Variation in moisture content may depend on type and amount of used filler.

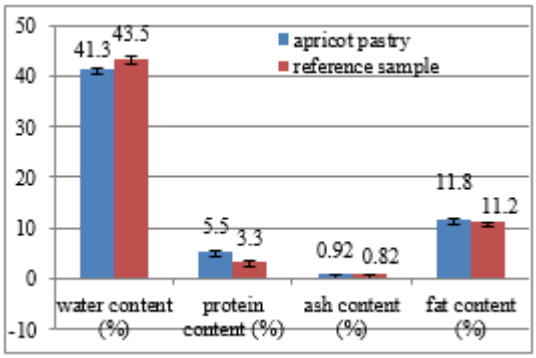

Figure 1. Physico-chemical characteristics of the studied samples

The moisture content of the product corresponds to reference standards, the product fulfilling the conditions required for storage in optimal conditions.

The protein content was 5.5% ($p<0.05$) for the test sample (Apricot String) and 3.3% for the control sample (Figure 1). As for protein content, no minimum or maximum limits have been found in the literature.

The content of minerals (Figure 1) ($p<0.05$) for obtained product (0.92%) is higher compared to reference value (0.82%). Apricot addition leads to an increased intake of mineral substances in obtained product. The ash content of the analyzed samples, which reflects the mineral substances of analyzed samples is within the limits of permissible values set in the standards and accoding to the values found in literature.

The lipid content (Figure 1) ($p<0.05$) of obtained product (11.8%) is compared with reference value (11.2%), thus fulfilling conditions necessary to preserve proper conditions admissibility for the finished product. Compared with other pastries, thes pastry shows a high lipid index due to it's high fat content of the dough composition, thereby limiting uses of food product which is not suitable for population with metabolic diseases, cardiovascular or hypolipidaemic mode indications.

The carbohydrate content (Figure 2) was determined by summing up fraction of lipid, protein, ash and water components, with a difference of up to 100 given by the carbohydrate fraction.

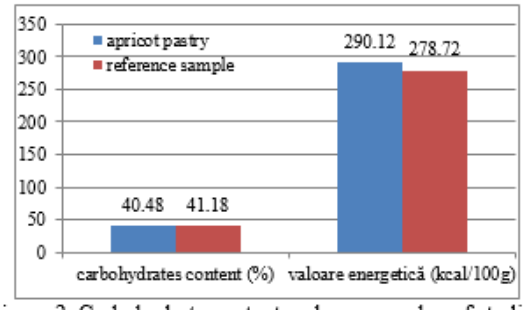

Figure 2. Carbohydrate content and energy value of studied samples

The carbohydrate content of obtained product is comparable to reference value, the product being within admissibility limits.

The amount of energy (Figure 2) and caloric intake was calculated by summing the given caloric intake of fat, carbohydrate and protein considering following composition: 1 g of fat = 9 kcal, 1 g protein = 4 kcal, 1 g carbohydrates = 4 kcal.

Nutritional qualities were studied by comparing the values obtained in terms of protein content, lipids, carbohydrate, the product obtained values similar materials retrieved from literature and reference standards [15].

The energy value corresponds to the reference value, but it is higher compared to other pastries.

Pimdit, K., et al., 2008 [16], reports for lower-value products lower values for humidity (25.46 ± 1.85%), higher for fat (22.72 ± 0.16%), protein (9.71 ± 0.02%), and for energy value (394.68 Kcal / 100g).

Reference consumption

The reference consumption at the Recommended Daily Dose (RDD) was also calculated, the results are shown in Figure 3.

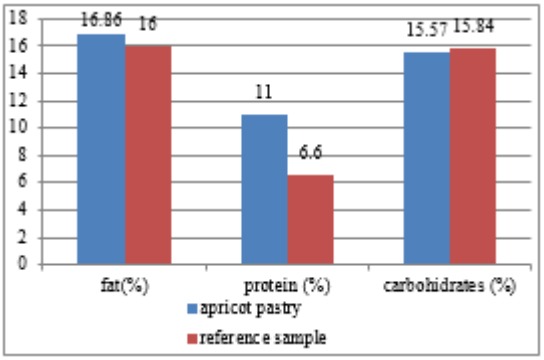

Figure 3. Referenced Consumption Reference (%) at Recommended Daily Dose (RDD)

Reference value for energy and nutrients is set for adults according to EC Regulation 1169/2011 [17] at 8400 kJ or 2000 kcal per day.

Reference Consumption (CR) Recommended Daily Dose (RDD) for mandatory nutrients is 70g / day for fats, 260g / day for carbohydrates and 50g / day for protein [17]. Comparing the values obtained for the studied products with reference sample of pastry with apricot of 16.86% fat, 11% protein and 15.57% carbohydrates with the values of the reference sample of 16% fat, 6.6% protein and 15.84% carbohydrates, it can be seen that consumption of 100 g with addition of daily apricot protein, requirement of the body is provided in a proportion of 11% compared with 6.6% in the product which has no apricot and shows the introduction of increasing nutritional product puree apricot in the making recipe. Differences in intake of lipids and carbohydrates are not significant.

Determining the content of macro and microelements

The content of macros and microelements ($p<0.05$) of the products analyzed is presented in Figures 4-5.

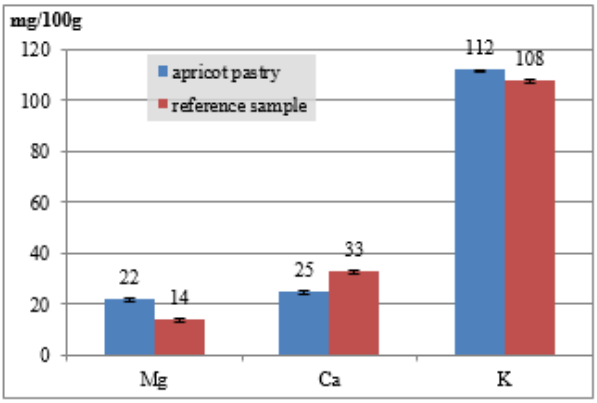

Figure 4. Content of macroelements (mg / 100 g)

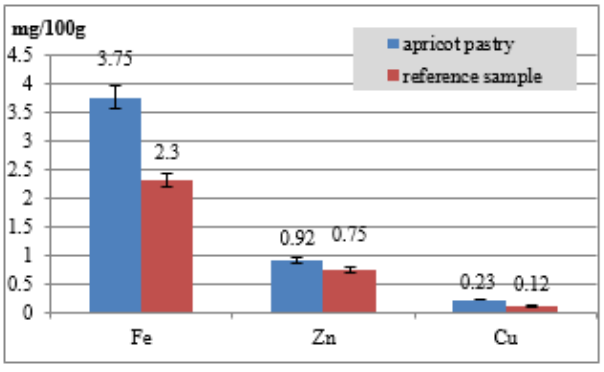

Figure 5. Content of microelements (mg / 100 g)

Farinaceous food is characterized by a significant high content of Mg and K and reduced of Ca [7].

The obtained experimental values indicate a reduced content of Ca, of 25 mg / 100 g in case of dough pastry with apricot and 33 mg / 100 g in case of simple pastry.

In pastry products the Mg content is 20-25 mg / 100 g product [6, 18]. Magnesium concentration found in the products obtained from pastry is 22 mg / 100 g in the case of added apricot and 14 mg / 100 g of product in the case of simple pastry. Introduction of apricots into the recipe results in an increase of the magnesium content of 8 mg / 100 g of product. Apricots are a vegetable matrix with a high content of magnesium.

Regarding the content of trace elements, apricots are rich in iron plant matrices. Thus, addition of apricots in formulation which has led to a much higher level of iron 2.3 mg / 100 g in case of simple dough from 3.75 mg / 100 g in the case of dough with apricots.

Pastry and bakery products, particularly those made from white flour have a low iron content, because of repeated processes of grinding and sifting of flour of wheat in order to obtain white flour, removes the grain content, rich in trace elements (C. Frontela, G. Ros, C. Martínez, 2011).

Apricots provide an important contribution of zinc in the body. 100 g of apricot provide daily zinc requirements of the body (0.2 mg) [9]. Addition of apricot in the meal helps to increase zinc content of the product. Thus, compared to the control product, which has a content of 0.75 mg Zn / 100 g product, apricot kernels have a content of 0.92 mg / 100 g product.

Copper content of the product obtained with apricot addition is superior to the control product (0.23 mg / 100 g compared to 0.12 mg / 100 g).

Previous research showed a high content of micro and macro elements in apricot [1,8,10] leading to an increase of the nutritional value of this pastry product added with apricot puree. Compared to the values reported in literature [11] for similar products with fruit filling, except for K values which are lower for the tested product (112 mg / 100 g compared with 149 mg / 100 g) other analyzed macroelements (Ca and Mg) had higher values to those reported in literature (15 mg / 100 g Ca and 9 mg / 100 mg). The content of trace elements (Zn, Cu, Fe) is higher than the values reported in literature (Fe: 3.75 mg / 100 g compared to 0.14 mg / 100g; Zn: 0.92 mg / 100 g compared with 0.19 mg / 100 g and Cu: 0.23 mg / 100g versus 0.03 mg / 100g).

Also J.M. Sanz-Penella et al., 2013 [19], reports a higher content of Ca (31mg / 100g), Mg (29 mg / 100g), K (188 mg/100g), Zn (1.165 mg/100g), Cu (0.225 mg / 100g) and less Fe (1.885 mg / 100g). The extra intake of microelements, especially Fe, is due to the addition of apricots that are recognized as Fe-rich matrices (Drogoudi et al., 2008, Gogoasa, 2003).

Higher intake of macronutrients (Mg, K) and trace elements (Fe, Zn, Cu) of the dough added with apricot compared to the control sample, increases the functionality of the product. Repletion of iron by eating apricot recommends to use this product in the diet of people suffering from iron deficiency anemia in order to diversify the product range.

Conclusions

The obtained experimental results revealed that obtained product corresponds in terms of nutritional properties to conditions of admissibility regulated by legislation. The addition of apricots in association with pastry to diversify its product range, also provides increasing of the nutritional value of the product, the contribution of minerals, proteins, fat and increasing the energy value of the product compared to reference without a filling. Functionality of the product is ensured by the increased intake of macroelements (Mg and Ca) and microelements (Fe, Cu, Zn), enrichment of the iron product recommends the use of the product in the diet of people suffering from iron deficiency anemia. Compared to the recommended daily dose of nutrients, pastry with fillings provide a double protein intake compared to the product without apricots.

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Compliance with Ethics Requirements. Authors declare that they respect the journal's ethics requirements. Authors declare that they have no conflict of interest and all procedures involving human / or animal subjects (if exist) respect the specific regulation and standards.

References

1. Akin, E.B., Karabulut, I., Topcu, A.,, Some compositional properties of main Malatya apricot (*Prunus armeniaca* L.) varieties. *Food Chemistry*, **2008**, *107*, 939-948.
2. Alexa, Ersilia, *Tehnologia alimentelor făinoase*, 2004, Editura Eurobit, Timișoara.
3. Alexa, Ersilia, *Tehnologii ale produselor alimentare de origine vegetală*, **2008**, Ed. Eurobit, Timişoara.
4. Bordei, Despina, *Tehnologia modernă a panificației*, 2004, Editura Agir, București.
5. Campbell, O.E., Merwin, I.A., Padilla-Zakour, O.I., Nutritional Quality of New York Peaches and Apricots, *New York fruit quarterly*, **2011**, *19*(4), 12-16.
6. Dashti, B., Al-Awadi, F., AlKandari, R., Ali, A., Al-Otaibi, J., Macro- and microelements contents of 32 Kuwaiti composite dishes, *Food Chemistry*, **2004**, 85(3): 331-337.
7. de la Guardia, M., Garrigues, S., Handbook of Mineral Elements in Food, Editura Wiley Blackwell, **2015**, 566.
8. Drogoudi, P.D., Vemmos, S., Pantedelis, G., Petri, E., Tzoutzoukou, C., Karayannis, I., Physical characters and antioxidant, sugar, and mineral nutrient contents in fruit from 29 apricot (*Prunus armeniaca* L.) cultivars and hybrids, *Journal of Agricultural and Food Chemistry*, **2008**, *56*, 10754-10760.
9. Frontela, C., Ros, G. Martínez, C.,, Phytic acid content and "in vitro" iron, calcium and zinc bioavailability in bakery products: The effect of processing, *Journal of Cereal Science*, **2011**, *54*, 173-179.
10. Gogoasa, I., Studies on contamination of vegetables and fruit with heavy metals in the West Zone of Romania. [PhD Thesis] Timisoara, Banat`s University of Agricultural Science and Veterinary Medicine ``King Michael I of Romania``from Timisoara, **2003**, 1-160.
11. https://www.tititudorancea.com/z/informatii_nutritionale_strudel_mere.htm, Accesat 10.06.2017.
12. Hussain, A., Yasmin, A., Javed, A., 2010, Comparative study of chemical composition of some dried apricot varieties grown in northern areas of Pakistan, *Pakistan Journal of Botany*, **2010**, *42*(4): 2497-2502.
13. Iordănescu, Olimpia, Pomology, Eurobit Publishing, 2008, Timisoara.
14. Kazemipour, Maryam, Ansari, M., Tajrobehkar, S., Majdzadeh, M., Kermani, H.R., Removal of lead, cadmium, zinc, and copper from industrial wastewater by carbon developed from walnut, hazelnut, almond, pistachio shell, and apricot stone. *Journal of Hazardous Materials*, **2008**, *150*(2), 322-327.
15. Pajin, B., Šoronja-Simović, D., Šereš, Z., Gyura, J., Radujko I., Sakač, M., Physicochemical and textural properties of puff pastry margarines, *European Journal of Lipid Science and Technology*, **2011**, *113*(2), 262–268.
16. Pimdit, K., Therdthai, N. and Jangchud, K., 2008, Effects of Fat Replacers on the Physical, Chemical and Sensory Characteristics of Puff Pastry, Kasetsart *J. (Nat. Sci.)*, **2008**, *42*, 739 - 746.
17. Regulamentul CE 1169/2011, Ghidul privind informarea consumatorilor cu privire la produsele alimentare
18. Rybicka, Iga Gliszczyńska-Świgło, Anna, 2017, Minerals in grain gluten-free products. The content of calcium, potassium, magnesium, sodium, copper, iron, manganese, and zinc, *Journal of Food Composition and Analysis*, **2017**, *59*, 61-67.
19. Sanz-Penella, J.M., Wronkowska, M., Soral-Smietana, M., Haros, M., Effect of whole amaranth flour on bread properties and nutritive value, *LWT - Food Science and Technology*, **2013**, 50, 679-685.
20. ***SP-602-97
21. ***SR 13013-3:1994 - Determinarea conținutului de proteină.
22. ***SR 91:2007 - Pâine și produse proaspete de patiserie. Metode de analiză.
23. ***SR EN 14082: 2003 - Produse alimentare. Determinarea microelementelor.