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Improvement of fatty acid profile in breads supplemented with chestnut, pumpkin, and rosehip flours

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Abstract

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The study investigated the effect of supplementation of the flours of chestnut, pumpkin seed, and rosehip on the quantity of some fatty acids of the wheat bread. The bread samples were prepared with non-traditional flours added in amounts of 5 and 10%. The flours were assayed for total protein, carbohydrates, lipids, dietary fibers, and reducing sugars. Based on the content of proteins, lipids and carbohydrates, the caloric value of each of the non-traditional flours used was calculated. Pumpkin seed flour has the highest protein and lipid contents (58% proteins, compared to 11.5% for the control wheat flour, and 11% lipids, compared to 1.4% for the control wheat flour, respectively), while chestnut and rosehip flours have a lower protein content than the control flour (7% and 2.2 %, respectively). No differences were observed in total carbohydrate content in wheat and chestnut flours (70.8% and 71.5%), and pumpkin seed and rosehip flours (33.8% and 39.4%). Caloric value results showed that higher caloric value have the flours with a higher content of total lipids. The content of palmitic and stearic fatty acids is the highest in the bread made from 100% wheat flour, and with an increase in the quantity of non-traditional flour added, their amount in the breads significantly decreases. Oleic acid content is the highest in breads supplemented with 5 and 10% chestnut flour, but linolenic acid content is the highest in breads supplemented with 5 and 10% rosehip flour, and arachidonic acid content is the highest in breads supplemented with 5 and 10% pumpkin seed flour. The content of linoleic acid in all tested breads, except for the one made from 100% wheat flour, was the same. Of all the studied unsaturated fatty acids, their content in bread made from 100% wheat flour has the lowest values.

Keywords: chestnut flour; pumpkin seed flour; rosehip flour; bread; fatty acids

Abbreviations: WF*:* wheat flour; PSF*:* pumpkin seed flour; CF*:* chestnut flour; RF*:* rosehip flour; SFA*:* saturated fatty acid; MUFA*:* monounsaturated fatty acid; PUFA*:* polyunsaturated fatty acid; TFA*:* trans-fatty acid; LDL*:* low-density lipoprotein; HDL*:* high-density lipoprotein

Introduction

One of the most widely consumed foods in Bulgaria is bread made from wheat flour, which is rich in carbohydrates, and provides more than 50% of the total energy intake. Improving the nutritional profile of white bread is a very interesting and widely studied idea. The consumption of wheat bakery products is associated with the presence of saturated fatty acids (SFAs) and trans-fatty acids (TFAs). These fatty acids cause an increase in plasma cholesterol, mainly low-density lipoprotein (LDL) cholesterol, and in the total high-density lipoprotein (HDL) cholesterol ratio, with a subsequent increase in cardiovascular risk (Mensink et al., 2003). The most characteristic SFAs in the human diet are palmitic and stearic fatty acids (Osuna et al., 2014). Omega-6 and omega-3 polyunsaturated fatty acids (PUFAs) are essential, they are not produced by the human body, and should be provided through food (Simopoulos, 2001; Kang, 2003). Omega-6 fatty acids are represented by linoleic acid (18:2ω-6) and omega-3 fatty acids by alpha-linolenic acid (18:3ω-3), as both essential fatty acids are metabolized to longer-chain fatty acids of 20 and 22 carbon atoms (Simopoulos, 2016). Unlike SFAs and TFAs, increasing the amount of omega-3 fatty acids in the diet reduce the risk of heart disease by lowering blood viscosity, lowering plasma fibrinogen to inhibit platelet aggregation, lowering serum triglyceride levels and lowering blood pressure (Sobhani et al., 2021).

Due to the high unsaturated fatty acids content of the pumpkin seed, chestnut, and rosehip flour, the fortification with these flours can be a good way to increase the PUFAs content of wheat bread. Nowadays, the most commonly used additives in the production of bread are herbs or herbs extracts, non-cereal grains and vegetables (Ibrahim et al., 2015), whole grains and seeds (Coelho & de las Mercedes Salas-Mellado, 2015; Verdú et al., 2017). Among others, such innovative additives as chestnut, pumpkin seed, and rosehip flours are usually used in the manufacture of formulated foods (Larsen et al., 2003; Pongjanta et al., 2006; Dabash et al., 2017; Igual et al., 2021).

On the other hand, partial substitution of wheat flour with non-traditional flours can decrease in quality and rheological features of bread. However, if these flours are used in an optimal preparation composition, it is possible to fortify breads with sufficient quality.

Rosa canina L. (rosehip) is a wild shrub growing in Europe. The fruits of the rosehip have been used in folk medicine for a long time. Rosehips have prophylactic and therapeutic actions against the common cold, infectious diseases, gastrointestinal disorders, urinary tract diseases, and inflammatory diseases (Chrubasik et al., 2008; Wenzig et al., 2008). Flour obtained from *Rosa canina* L. reduces osteoarthritis symptoms in clinical trials (Christensen et al., 2008; Kharazmi, 2008). The presence of bioactive compounds such as ascorbic acid, carotenoids, and phenolic compounds are associated with health benefits of rosehips. The lipid fraction of the rosehip seed contains more than 50% PUFAs (Szentmihalyi et al., 2002). The influence of the addition of rosehip flour on the dough properties and wheat bread characteristics has been studied by different authors (Vartolomei & Turtoi, 2021; Gül & Şen, 2017).

Chestnuts (*Castanea* sp.) are characterized by low fat (20–50 g/kg) and protein (20–40 g/kg) contents but a high carbohydrate content (Künsch et al., 2001; Barreira et al., 2009). The main nutrient in the chestnut is starch, which accounts for ~60% of the dry weight. In addition, the consumption of chestnuts makes an important contribution to the intake of micronutrients such as vitamins, minerals and trace elements as well as bioactive compounds such as phenolics. The fat of this fruit is characterized by a high amount of unsaturated fatty acids, and is an important source of the essential fatty acids (linoleic and linolenic acids), which plays an important role in preventing cardiovascular diseases. Chestnut flour has been used as an additive to gluten-free bread formulations which affects shelf-life and quality parameters of bread (Demirkesen et al., 2010; Paciulli et al., 2016), physico-chemical properties and volatiles (Dall'Asta et al., 2013).

Cucurbita pepo (Pumpkin) is a plant which is traditionally used to treat a wide variety of diseases. Pumpkin seeds are rich in oil (15.8–33.5%) (Mohamed et al., 2015) and the variability in the oil content is very high resulting from a broad genetic diversity. The four dominant fatty acids are palmitic, stearic, oleic and linoleic acids. These four fatty acids make up 98±0.13% of the total amount of fatty acids, as their content was significantly affected by the crop season and processing. Others fatty acids being found at levels well below 0.5% (Murkovic et al., 1996). Pumpkin seed flour has been used for nutritional enrichment and for improving the rheological and sensory properties of different bakery products, including bread (Abdelghafor et al., 2011; Costa et al., 2018). Although there are publications on their incorporation into bread recipes, studies aimed at investigating the effect of rosehip, chestnut and pumpkin seed flour on the fatty acid profile of wheat bread are scarce.

The aim of this study was to improve the fatty acids profile of breads made with the addition of 5% and 10% of three non-traditional flours (pumpkin seed, chestnut, and rosehip) and to analyse the effect of their use on the amount of certain basic saturated and unsaturated fatty acids on the finished product (bread).

Materials and Methods

For the preparation of the bread samples, the following materials were used:

− commercial wheat flour – according to standard Bulgaria 01/2011, pumpkin seed flour from defatted peeled pumpkin seeds, chestnut flour, and rosehip flour were purchased from a local market;

− water – according to ISO 6107-1:2004;

− commercial yeast (Lesafmaya);

− salt – according to Codex Standard for Food Grade Salt CX STAN 150-1985.

All chemicals used were of analytical grade and were obtained from Merck KGaA (Darmstadt, Germany) via Fillab (Plovdiv, Bulgaria).

Preparation of dough and bread samples

Bread was obtained by a two-phase method. Initially, knead the yeast, flour (control and experimental samples to obtain 100 g) and water of dough in a 1:1 ratio in kneading machine (Labomix 1000, Hungary). The dough thus prepared matured for 60 min at 30 – 32°C (relative humidity level 75 – 80 %) and then was mixed to obtain a homogeneous mass by adding the remainder of the flour according to the formulation and salt (1.33 kg/100 kg flour). The bread dough was divided into pieces of a certain weight (440 g) and was formed, for proofing time – 55 minutes at 32–34°C (relative humidity level 75 – 80 %) (Tecnopast CRN 45–12, Novacel ROVIMPEX Novaledo, Italy). After the final fermentation, the pieces of dough were put into an electric oven (Salva E-25, Spain) pre-heated to 220–230°C. The baking time was 24 min. After baking, the bread was allowed to cool down for 3 h at room temperature.

The details of bread formulations are given in Table 1.

Analytical methods

Total carbohydrates. Total carbohydrates were quantified by Dubois et al. (1956).

Reducing sugars. Reducing sugars were established by the Luff-Schoorl method (Dekker, 1950).

Total lipids. Total lipids were analyzed by Bligh and Dyer (1959).

Total proteins. Total proteins were analyzed by Bradford (1976). Bovine serum albumin was used for the standard curve needed for the quantification of the protein.

Total dietary fibers. Total dietary fibers (soluble and insoluble) were determined according to AOAC method (1994), using a Total Dietary Fiber Assay кit (K-TDFR-100A, Megazyme, Ireland).

Fatty acid composition. The analysis was performed according to BDS EN ISO 12966-4:2015. The extraction of total lipids was performed by the conventional method, as the methyl esters of fatty acids were analyzed using a gas chromatograph "Shimadzu GC-17A" equipped with an automatic injector (AOC 2), a Restek (19091N-213) column (100 m length × 0.32 mm inside diameter, and 0.5 µm film thickness), and a flame ionization detector (FID). The tested sample was placed in a suitable flask and 4 ml of methanolic NaOH solution and boiling aid were added. A Graham condenser was connected to the flask. If the fatty acids contain more than two double bonds, the air from the flask was removed by blowing with dry nitrogen for a few minutes. The sample is boiled for 5 to 10 minutes, shaking the flask periodically. Then 5 ml of boron trifluoride methanol solution through the upper end of the condenser were added. Boiling lasts 3 min 1 to 3 ml of isooctane are added to the boiling mixture through the upper end of the condenser. When the heating of the flask is completed 20 ml of NaCl solution are added immediately. The flask should be closed and shaken vigorously for at least 15 s. Saturated NaCl solution is added so that the liquid level is up to the neck of the flask. The two phases are separated in a separating funnel. 1-2 ml of the upper isooctane layer are placed in a 4 ml vial and anhydrous sodium sulphate is added to remove all traces of water. The isooctane solution thus obtained can be injected (ISO 5508:1990). The temperature of the injector and detector was kept at 250°C. The injection volume was 1 µl. Fatty acids were identified by comparison of their retention times with those of authentic standards and reported as g/100 g fat.

Caloric value. Caloric value was estimated by Atwater coefficients: 4 kcal g^{-1} for proteins, 4 kcal g^{-1} for carbohydrates, and 9 kcal g^{-1} for lipids according to Kurek et al. (2018).

Data analysis. The tests were conducted with three replications. Data were analyzed by one-way analysis of variance (ANOVA) using Statgraphics Centurion statistical program (version XVI, 2009) (Stat Point Technologies, Ins., Warrenton, VA, USA). To compare the means, Fisher's least significant difference test was used for paired comparison with a significance level α = 0.05.

Table 1. The formulations of breads (% on the flour basis)

Ingredients	Control (100% WF)	with PSF, %		with CF, %		with RF, %	
		5	10	5	10	5	10
WF, g	450	427.5	405.0	427.5	405.0	427.5	405.0
Water, ml	248	248	248	248	248	248	248
Yeast, g	9.00	9.00	9.00	9.00	9.00	9.00	9.00
Salt, g	6.00	6.00	6.00	6.00	6.00	6.00	6.00
PSF, g	–	22.5	45.0	–	–	–	–
CF, g	–	–	–	22.5	45.0	–	–
RF, g	–	–	–	–	–	22.5	45.0

Results and Discussions

Biochemical composition and caloric value of the used flours

The biochemical composition of the raw ingredients (WF, PSF, CF, and RF) is given in Table 2. The highest content of total protein and lipids was found in PSF (58% and 11%, respectively), total carbohydrates in WF and CF (70.8% and 71.5%, respectively), reducing sugars in CF (30.2%), total dietary fibers in RF (22.8%). The obtained results are consistent with the data presented by other authors. Similar results of the chemical composition of PSF were presented by Saeleaw & Schleining (2011). According to Norfezah et al. (2011), pumpkins contain significant amounts of protein, soluble and insoluble fibers and tocopherol, because of which the use of pumpkin and pumpkin seed flour in food products may contribute to a healthier diet. Kumar et al. (2011) provide data on the composition of white flour used in bread-making – protein 11.5%, lipids 1.4%, carbohydrates 75.3%, sugars 1.4%, which values are also very close to our results. Physico-chemical composition of native CF in the work of Wani et al. (2017) is similar to that of the flour we used in our experiments – protein 4.73 %, lipids 4.81 %, carbohydrates 79.39 %. Vartolomei & Turtoi (2021) determined a higher protein and carbohydrate content in rosehip flour – 4.89% and 73.66%, respectively, when they put it into wheat bread production. However, the fiber content is significantly lower compared to the flour we used – 8.63% versus 22.8% in our work.

Caloric values of the flours were in the range of 168-466 kcal/100 g. The highest caloric value showed PSF – 466 kcal/100 g, which is a consequence of the highest determined values for total protein and lipid content. The calculated values for WF and CF are similar (336 and 349 kcal/100 g), due to close values for protein, lipid and carbohydrate content. The lower caloric value had RF – 168 kcal/100 g, which is of minimal lipid and carbohydrate content. On the other hand, according to Kurek et al. (2018), the higher the dietary fiber content, the lower the caloric value of the product. This is also confirmed in our research on RF, in the composition of which fibers were in the largest amount (22.8%).

Effect of chestnut, pumpkin seed and rosehip flours addition on the content of saturated fatty acids in wheat bread

The incorporation of non-traditional flours in bread formulations produced changes in the total content of palmitic and stearic fatty acids. Any addition of non-traditional flour led to a decrease in the content of the studied saturated fatty acids compared to the control sample – WF (Table 3). With an increase in the percentages of non-traditional flour used, the amount of saturated fatty acids decreased. The most significant was the decrease in the amount of palmitic acid when used RF, followed by CF, and PSF. Replacing the wheat flour with 5% RF reduced the amount of palmitic acid in the final product with 64.4%, but when the same flour was put in 10% concentration, the reduction reached a value of 77.5%. The use of CF lowered the amount of palmitic acid with 59.3% and 70.1%, and the use of PSF with 50.5% and 63.9%, when were added at the same concentrations. Regarding stearic acid, the decrease in its amount when adding non-traditional flours was also so noticeable. Breads made with 5% and 10% CF had the lowest content of stearic acid – reduction with 63.8% and 79%, respectively. A similar significant reduction in stearic acid was observed in bread made with 10% PSF –71% reduction compared to the control.

Table 2. The composition of flours used in the study

Flour	Total protein, %	Total lipids, %	Total carbohydrates, %	Reducing sugars, %	Total dietary fibers, %	Energy, kcal/100 g
WF	11.5±0.42	1.4±0.09	70.8±0.87	3.10±0.15	5.1±0.25	336
PSF	58.0±0.78	11.0±0.25	33.8±0.64	0±0.00	16.8±0.37	466
CF	7.0±0.20	3.9±0.41	71.5±1.05	30.2±0.10	10.5±0.40	349
RF	2.2±0.15	0.2±0.08	39.4±0.87	3.5±0.15	22.8±0.15	168

Results were calculated on a dry matter basis (WF: 91.55±0.49%, PSF: 89.14±0.23%, CF: 88.89±0.38%, RF: 90.04±0.52%)

Table 3. Content of saturated palmitic and stearic fatty acids in breads

Saturated fatty acids, g/100 g fat	Bread with:						
	WF	RF		CF		PSF	
	100%	5%	10%	5%	10%	5%	10%
Palmitic acid (16:0)	27.05 ± 3.83^{a}	9.64± 1.36^{bcd}	6.09± 0.86^{d}	11.00± 1.56^{bc}	8.09± 1.15^{cd}	13.38± 1.90^{b}	9.76± 1.39^{bcd}
Stearic acid (18:0)	9.52± 1.34^{a}	4.82±0.68^{bc}	4.00± 0.57^{bcd}	3.45± 0.49^{cde}	2.00± 0.28^{e}	5.69± 0.81^{b}	2.76± 0.40^{de}

$^{a-e}$: Means in a row without a common letter differ significantly ($p < 0.05$)

Regarding SFAs is known that they have adverse effect on plasma lipids and their consumption is associated with a high cardiovascular risk, so the recommendation is to reduce consumption of these fatty acids. For this reason, if SFAs are replaced by PUFAs, the cardiovascular risk will be reduced. Current US and EU dietary guidelines recommend reduction of SFAs and replacement with PUFAs and/or MUFAs respectively (WHO, 2003; DeSalvo et al., 2016). According to Astrup et al. (2011), replacing 1% of energy intake from SFAs with PUFAs has been associated with a 2–3% reduction in the incidence of coronary heart disease. Vafeiadou et al. (2015) illustrated that replacing SFAs with n-6 PUFAs for 16-weeks induced a reduction in serum concentration of LDL-cholesterol (a major risk factor for cardiovascular disease) by 13.6%, with a comparable reduction of 11.3% on replacement of SFAs with MUFAs. Most dietary recommendations aim to reduce SFAs intake to ≤10% of energy, which require changes in dietary patterns. Thus, the consumption of bread made with the investigated non-traditional flours would help achieve this effect.

Effect of chestnut, pumpkin seed and rosehip flours addition on the content of unsaturated fatty acids in wheat bread made with 5 and 10%

Figures 1, 2, 3 and 4 show the relative quantities of oleic, linoleic, linolenic, and arachidonic fatty acids in breads made with 5 and 10% pumpkin seed, chestnut, and rosehip flour. The incorporation of non-traditional flours in bread formulations produced changes in the content of unsaturated fatty acids and showed significant differences with the control (made by 100% WF). Differences in the content of fatty acids between the results presented by different authors may be related to environmental conditions (climate and altitude etc.), which are known to have an impact on fatty acid composition.

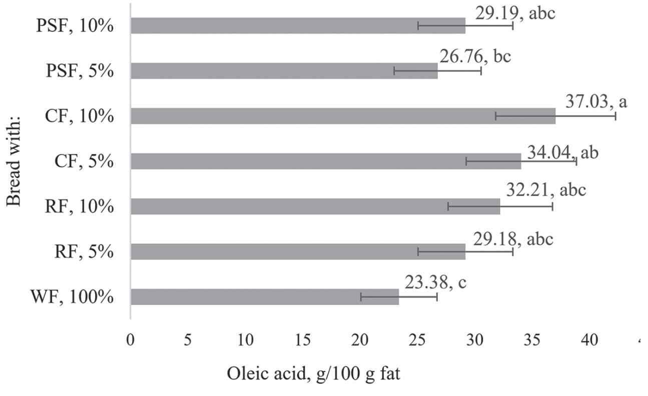

Fig. 1. Oleic acid content in breads

The oleic acid content was found to be the highest (37.03 g/100 g fat) in bread made with 10% CF (Figure 1). The similar results showed bread wih 5% CF (34.04 g/100 g fat), and the same were the values for breads with 10% PSF, 5 and 10% RF. In this study, the percentage of oleic acid in control sample was the lowest (23.38 g/100 g fat).

Oleic nonessential fatty acid decreases the circulating concentration of the LDL cholesterol in humans (Kwon & Choi, 2015) and has been found to increase the beneficial HDL cholesterol concentration in blood (Gilmore et al., 2011). Thus, consuming bread with a higher oleic acid content would help to reduce the risk of cardiovascular disease by reducing blood lipids, primarily cholesterol. Furthermore, Nogoy et al. (2020) found out that the body weight of experimental animals (rats) was significantly affected by the intake of oleic acid.

Linoleic acid content of all non-traditional breads was higher (47.88-54.96 g/100 g fat) than the control sample (16.23 g/100 g fat). The results showed that there was no statistically significant difference in the non-traditional flours used and their concentrations (Figure 2).

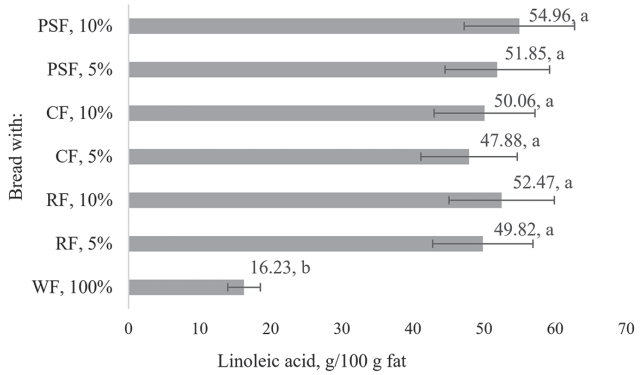

Fig. 2. Linoleic acid content in breads

Among all the bread samples evaluated, those enriched with 5 and 10% RF showed the highest content of linolenic acid (Figure 3). The results obtained using the remaining two non-traditional flours were comparable to those of the control sample.

According to Pardo et al. (2009), the rosehip-seed oil contained a higher percentage of linolenic acid compared to the grape-seed oils. Moreover, the rosehip seed revealed a higher level of linolenic acid than vegetable oils such as canola and soybean oils, the main dietary sources of linolenic acid. High levels of linoleic acid and linolenic acid of the rosehip-seed oil can make it susceptible to lipid oxidation. However, its antioxidant content may enhance oxidative stability. Linolenic acid has a protective effect against heart disease and is important in the development of the brain and retina (Connor, 1999). Linoleic and linolenic essential fatty acids are precursors of omega-3 and omega-6 fatty acids. A balanced omega-6 fatty acid and omega-3 fatty acid intake is important in the prevention of chronic diseases such as coronary heart disease and cancers. The recommended ratio of omega-6 fatty acids to omega-3 fatty acid ranges from 1:1 to 4:1 (Yehuda, 2003). The higher percentage of polyunsaturated fatty acids and the ratio of linolenic acid to linoleic acid may make rosehip flour a valuable source for omega fatty acids.

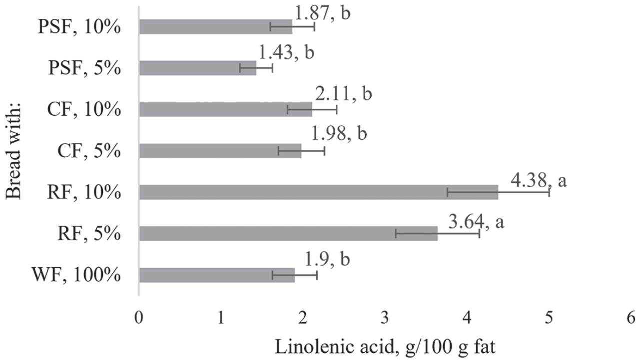

Fig. 3. Linolenic acid content in breads

Arachidonic acid is a potent bioactive molecule. When is released from membrane phospholipids, it is converted to a variety of bioactive compounds, called eicosanoids. These oxidized lipid molecules are related to a number of chronic diseases including cardiovascular disease, cancer and inflammation (Allayee et al., 2009). The results on the effect of non-traditional flour on the arachidonic acid content of wheat bread are presented in Figure 4. All input non-traditional flours in both concentrations showed higher arachidonic acid content compared to the control sample (0.57-0.92 g/100g fat vs. 0.45 g/100g fat). The addition of 10% PSF most significantly affected the amount of the studied fatty acid, and even at the lower concentration, the amount of arachidonic acid was higher than the addition of the two other flours (CF and RF).

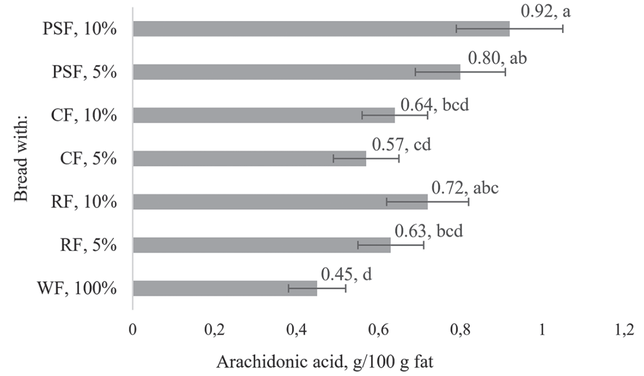

Fig. 4. Arachidonic acid content in breads

The ratio of SFA: MUFA:PUFA of the studied fatty acids is presented in Figure 5. In all breads produced with the participation of non-traditional flour, the amounts of fatty acids from all groups approached 100%, which demonstrated that the studied fatty acids are basic in the composition of the produced breads. For comparison, in the control sample, the total amount of fatty acids reached 78.53%, which means that other types of fatty acids are also involved in the composition of wheat flour. In general, however, it is clear from the figure that the amount of SFAs is highest in the bread made from 100% wheat flour. In addition, for all breads made with non-traditional flours, the amount of PUFAs exceeded 50%, followed by MUFAs (26.76-37.03%), and the lowest was the amount of SFAs (10.09-19.07%). Regarding the amount of PUFAs, there is no difference between the breads made with the two concentrations of RF and PSF. The values obtained when using CF were slightly lower. The results obtained by us differ significantly from the data of Maggio & Orecchio (2018), according to which the fatty acid profile of gluten-free bakery products showed that MUFA represent the majority fatty acid group, followed by SFA (30%) and PUFA (13%).

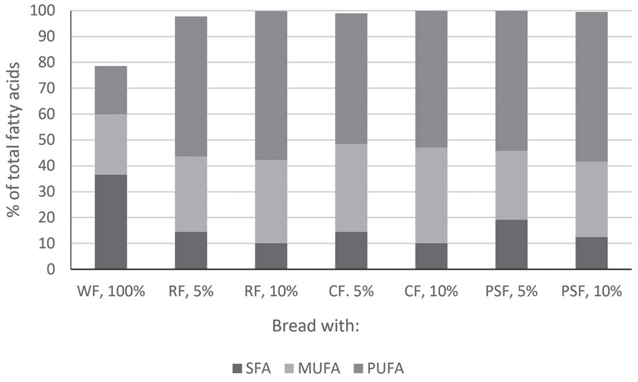

Figure 5. Proportions of fatty acid groups (% of total fatty acids) of the prepared breads

Comparing PUFA/SFA, the most favorable ratio was for bread with 10% RF (5.71) and 10% CF (5.23), followed by bread with 10% PSF (4.61), 5% RF (3.75), 5% CF (3.49), and 5% PSF (2.84). The higher PUFA/SFA ratio, the more positive effect on cardiovascular health (Chen & Liu, 2020). Culetu et al. (2021) explored gluten-free flours and established the most favorable PUFA/SFA ratio for chickpea

(4.7), quinoa (4.5), millet and maize (3.9), gram (3.2), and teff (3.1) flours. The values obtained by them are close to those determined in our work, but they studied flours that were not subjected to heat treatment. Different culinary conditions, especially the temperature and the time of heat processing, can influence the fatty acid composition (Rudziñska et al., 2005; Kmiecik et al., 2009). SFAs are more stable than unsaturated fatty acids, and similarly MUFAs are more stable when compared to PUFAs (Choe & Min, 2007). According to Dordevic et al. (2020), a heating temperature of 220°C resulted in similar decrease in MUFAs and PUFAs in both extra virgin and refined olive oil samples.

Conclusions

The findings of this study showed that PSF, CF, and RF affected the fatty acid profile of bread. Adding such flours to the wheat bread recipe leads to a decrease in the amount of saturated fatty acids. The most significant was the decrease in the amount of palmitic acid when used 10% RF – the reduction reached a value of 77.5%. Regarding stearic acid, breads made with 5% and 10% CF had the lowest content – reduction with 63.8% and 79% respectively, compared to the control. Consumption of foods rich in unsaturated fatty acids is recommended to reduce the risk of chronic diseases. The nutritional composition of the non-traditional flours makes them valuable food source. The oleic acid content was the highest (37.03 g/100 g fat) in bread made with 10% CF, while in control sample was the lowest (23.38 g/100 g fat). Linoleic acid content of all non-traditional breads was higher (47.88-54.96 g/100 g fat) than the control sample (16.23 g/100 g fat). The bread samples enriched with RF showed the highest content of linolenic acid. All bread samples with non-traditional flours in both concentrations had higher arachidonic acid content compared to the control sample (0.57-0.92 g/100g fat vs. 0.45 g/100g fat). To improve health conditions, the accent is to lower the consumption of SFAs, increasing the PUFAs and MUFAs intake; thus, PSF, CF, and RF are good alternatives.

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