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Research Article

Comparing the Properties of Improved Breads with Omega-3 and Flaxseed Oil and Examining its Effect on Rheological and Sensory Characteristics

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ABSTRACT

Omega-3 is one of the essential fatty acids and is monumental for human health. But it is not produced by the human body, so it must be provided by food. In this study, flaxseed oil and fish oil as sources of omega-3 in 7 g and 12 g have been added to wheat flour dough. The production of breads has been done in the traditional way. Rheological characteristics of bread samples have been determined, the organoleptic properties of omega-3 breads are maintained for 1, 3, 5 days and evaluated by sensory method. The sensory properties of bread with flaxseed improved on the first day, but over time, the sensory quality of bread decreased. Bread containing fish oil received low points in terms of organoleptic and rheological, it was not accepted. Fatty acid profile showed the level of omega3, DHA, DPA, PUFA, MUFA, ALA and SFA in these two tests did not change for 5 days. Due to the high amount of omega-3s in flaxseed bread compared to fish oil bread, bread enriched with flaxseed oil on the first day of baking is suitable for production, both in terms of nutrients (omega-3 content) and sensory and rheological.

Keywords: Flax; Enrichment; Omega 3; Rheological

INTRODUCTION

Foods are mainly of a plant origin, wheat in the form of bread, being the main staple. Food enrichment is a way to compensate for micronutrient deficiencies and to minimize or control essential micronutrient deficiencies Omega-3 fatty acids are essential to overall growth. It has been effective in the treatment of many diseases and is not produced by the human body, so it should be provided through food [1-3].

Healthy food can be used as the first medicine in the treatment of many diseases; therefore, the use of enriched bread in the diet of people due to their high nutritional value and improving the rheological properties of the dough and improving the organoleptic properties of bread is important. The most important omega-3 fatty acids in terms of nutrition include alpha-linolenic acid, eicosapentaenoic acid and docosahexaenoic acid. Fatty acids (omega-3) are found large amounts in certain vegetable oils such as flaxseed oil and to a lesser extent in canola, soy and walnut oils [4-6].

Many fats are sensitive to heat, light and oxygen, so they oxidize quickly. Oxidation of fatty acids is one of the main causes of food spoilage and can affect the taste, aroma, texture, shelf life and color of food. FDA allowed the labeling of foods and dietary supplements containing EPA and DHA to be effective in reducing cardiovascular disease [3,7,8].

There is strong evidence that the risk of cardiovascular disease, high blood pressure and atherosclerosis is reduced by increasing the amount of omega-3 fatty acids in the diet Omega-3 fatty acids 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. Omega-3 supplements can lower total cholesterol in the body. Nutritional deficiency of these fatty acids can be associated with problems such as limited growth, irregular fatty acids in body tissue and fertility [9-12].

Low levels of omega-3 fatty acids in red blood cells are linked to neurological disorders attention deficit hyperactivity disorder, Alzheimer's disease and depression, but research has not yet confirmed that omega-3 fatty acids can improve the symptoms of

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these diseases Investigation of omega-3 sources with the aim of improving the nutritional, rheological and organoleptic properties was added to the bread formulation as a suitable additive, and the effects of its various features were evaluated [13,14].

MATERIAL AND METHODS

Special flour for bread (18% star flour) and bakery yeast named Razavi were used, consumable salt includes common iodized salt under the brand name Crystal, the required water is supplied from semi-hot municipal piped water, Flaxseed oil and polyethylene bag was made under the brand name Penguin.

Method of making barbary bread

Dough formulation: The amount of dough used to prepare each chin in this study was 200 g, and we weighed 7 g of flaxseed oil based on the weight of the dough, 4 g of salt and 10 g of yeast were weighed. The amount of water consumed was 750 cc based on the weight of the flour, after baking the breads were cooled to room temperature and kept in ziplock bags.

Steps of dough preparation: First sift the flour, add salt, yeast and add a certain amount of water. After mixing, we rested the dough for 45 minutes and divided the dough into 200 g and rested the dough again for 15 minutes, dough was then placed in a home oven for 60 to 90 minutes. Gas stove with a temperature of 200°C-250°C was used, the breads were packed and labeled in polyethylene bags after being removed from the gas oven and cooled to room temperature [15].

Investigation of fatty acid profiles

Folch method was used to extract fat and study the profile of fatty acids. Methyl ester of fatty acids was prepared according to ISO: 5508 standard and cold method. Methyl esters by ISO method: 5509 with TRACEGC Thermofininigan ITALYT gas chromatography device, equipped with Split/Splitless injector, FID detector, column with specifications (BPX 70: 60 m length, 0.25 mm ID, 0.25 dm df), nitrogen carrier gas with flow rate was 0.8 ml/min and the injection chamber temperature was 270°C. Crush 50 grams of bread and add it to normal hexane so that it covers the bread until it is completely mixed. Strain the mixture to separate the oil and hexane from the bread, put the liquid mixture in a rotary to separate the oil from the hexane. The obtained oil is methylated with 2 M Methanolic potash and normal hexane and homogenized. The methylated oil is removed at 55°C and removed from its upper phase and injected into a GC machine [16,17].

Sensory test

Descriptive test was used to evaluate sensory characteristics. The purpose of this test was to determine the intensity of the desired characteristics and was performed by 12 evaluators. Samples are anonymous and coded with a pre-designed form. The existing and usable form in Tehran Grain Research Institute, prepared according to the standard (AACC No.30-74, 2000) including attributes with their specific coefficients were provided to the evaluators. The evaluators gave each feature a score of 1-5, which was multiplied by its specific coefficient and the final score was obtained, the total score is divided by 20 to get the bread score (quality number). The bread grading in these forms according to the quality number was as follows: Score 5: Excellent, Score 5/4-99/4: Very good, 4-49/4: Good, 3-99/3: Acceptable and less than 3: Unsatisfactory (Table 1).

Table 1: An example of a bread sensory evaluation form.

Coefficient	Bread Feature
2	Form and Shape
2	Bottom surface feature
2	surface feature Low
1	Color
4	Bread texture
4	Ability to chew
2	Perfume and Smell
3	Taste
20	Total/20=Bread rating (Quality number)

Methods and tools for data analysis

Statistical analysis of mini-tab software and analysis of variance were used to analyze the data. Tukey test was used to compare the means and to investigate the simple and interaction effects of the factors.

RESULTS

Bread Nut Toughness Test Texture Profile Analysis (TPA)

The process of hardening the bread crust is usually due to two reasons: the hardening that results from the transfer of moisture from to the crust and the inherent hardening of the cellular material that goes back to the recrystallization of starch Bread resistance to deformation is a tissue property that indicates the stability and strength of bread kernels and the degree of this strength and its increase over time is an important factor in evaluating bread stale [18-20].

According to the obtained results, the amount of bread kernel stiffness in this treatment has increased with increasing test time, i.e over time ($p<0.05$). These results are consistent with the research. Evaluation of organoleptic properties by sensory method such as aroma, shell color, smell and taste analysis of bread properties based on five senses was used. Tissue of bread samples containing omega-3 oil was used during storage at intervals of 1, 3 and 5 days using a tissue measuring device. The texture of omega-3 breads was

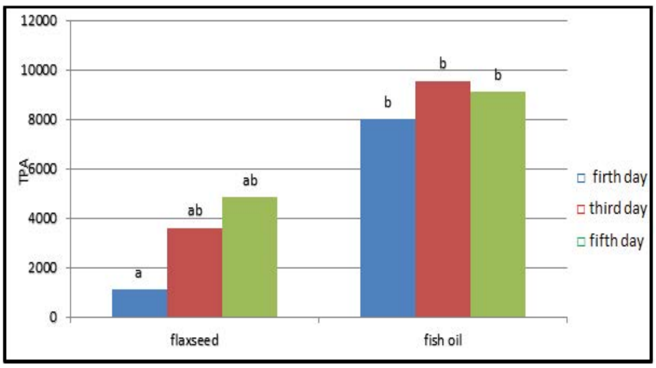

Figure 1: The effect of increasing omega-3 sources on bread crust (Newton).

examined on days 1, 3 and 5 using a Texture Analyser. Hardness of bread during storage is usually associated with loss of moisture in bread. Excel software and mini-tab were used to draw the charts (Figure 1). All experiments were performed in 2 replications [21,22].

Sensory test results

Based on sensory tests, the characteristics of the surface and shape had the best score on the first day, but over time we saw a decline in quality (p<0.05).

The results of the lower surface properties have been in harmony with the results of the surface properties and the quality has decreased over time (p<0.05). Bread color score in these treatments has decreased over time (p<0.05). Bread texture is also the highest score related to the first day of storage, which over time we saw a decrease in the quality of bread texture. The best chew ability score, which decreased with increasing shelf life (p<0.05). The best Perfume and Smell of bread has received less points over time (p<0.05). The best taste of bread, like the above results, is related to the first day of baking, which decreases the taste score with the passage of bread storage time (p<0.05) (Figure 2). The quality score of bread, which is the result of the sum of all the characteristics of bread, is the highest quality score of the bread sample of the first day of baking, which has lost its quality during five days of storage (p<0.05). The highest score for the sensory test was observed in the bread of the first day of storage, which decreased in quality over time (p<0.05) (figure 3).

Results of fatty acid profile test

The total amount of Saturated Fatty Acids (SFA) in this treatment did not change during 5 days of storage and there was no statistically significant difference (p<0.05). The total amount of Saturated Fatty Acids (SFA) in this treatment did not change during 5 days of

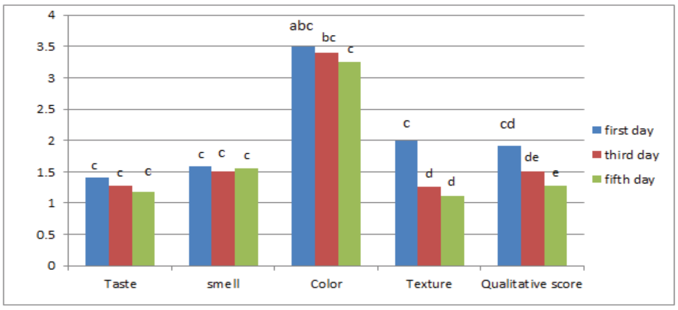

Figure 2: The effect of adding fish oil on the sensory properties of bread during the five-day storage period.

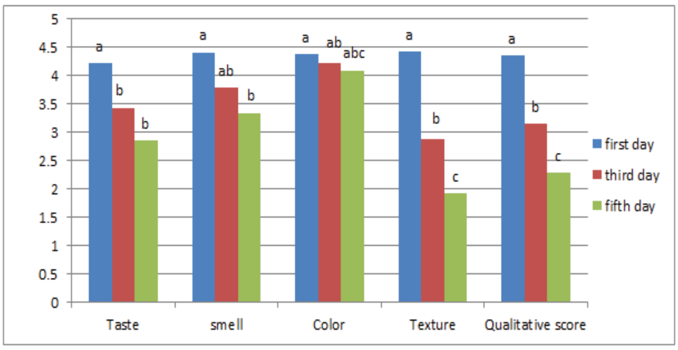

Figure 3: The effect of adding flaxseed oil (flax) on the sensory properties of bread during the five-day storage period.

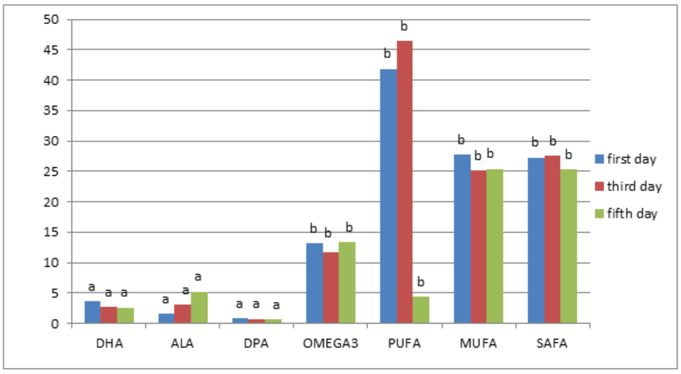

Figure 4: Profile of fatty acids of bread enriched with fish oil.

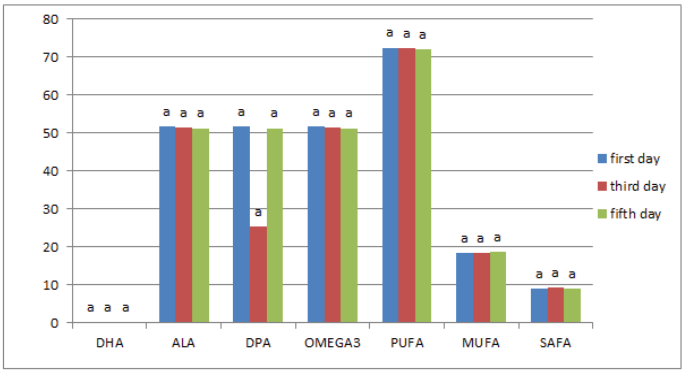

Figure 5: Profile of fatty acids of bread enriched with linseed oil.

storage and there was no statistically significant difference (p<0.05). Mono Unsaturated Fatty Acids (MUFA) with a double bond also did not show a statistically significant difference in both treatments after five days (p<0.05).

There was no difference in the amount of omega-3 in this treatment after five days, which did not have a statistically significant difference (p<0.05). Showed a decreasing trend in omega-3 levels over a period of 30 days, which has a statistically significant difference (p<0.05). The total amount of Polyunsaturated Fatty Acids (PUFA) remained constant over time in both treatments of fish oil, which did not have a statistically significant difference (p<0.05). Docosahexaenoic Acid (DHA) did not change in fish oil bread and there was no statistically significant difference (Figure 4). Investigation of Alpha Linolenic Acid (ALA) persistence in this treatment can be seen that there is no statistically significant difference (p<0.05). Nutritional results showed that Docosahexaenoic Acid (DPA) remained constant during 5 days of storage in fish oil treatment, which did not show a statistically significant difference (p<0.05). After 30 days of storage showed no statistically significant difference (p<0.05). The omega-3 from this study was consistent and it did not change during these days (Figure 5).

DISCUSSION

Regarding bread stiffness test, the highest score of this treatment was related to the first day of storage, which decreased over time (p<0.05). Flax bread is suitable for production and suitable for consumption on the first day of baking.

In the sensory test, the best result is the bread of the first day of baking because its organoleptic properties have decreased over time (p<0.05). The sensory and rheological score of this bread decreases over time, so flax bread is suitable for production and suitable for consumption on the first day of baking. In sensory test, the best result of these two samples was bread containing flaxseed oil on the first day of baking, and over time the retention of organoleptic properties decreased less ($p<0.05$). Regarding the fatty acid test of these two large bread samples, the amount of omega 3, Mono Unsaturated fatty acids (MUFA), Saturated Fatty Acids (SAFA), Polyunsaturated Fatty Acids (PUFA) and Alpha Linolenic Acid (ALA) remained constant and did not change ($p<0.05$). Omega-3 Docosahexaenoic Acid (DPA), Saturated Fatty Acids (SAFA), Mono Unsaturated fatty acids (MUFA), Polyunsaturated Fatty Acids (PUFA), Alpha Linolenic Acid (ALA) and Docosahexaenoic Acid (DHA) levels did not change in fish bread ($p<0.05$). Flax bread has the highest amount of omega-3 and no Docosahexaenoic Acid (DHA), while bread contains fish oil Docosahexaenoic Acid (DHA) and has the lowest amount of omega-3.

Docosahexaenoic Acid (DHA) is an essential fatty acid that belongs to the family of n-3 fatty acids. As a result both of samples will be a good source of omega-3. The fatty acids of bread enriched with linseed oil remain stable for five days after baking and have a higher omega-3 and are suitable for production. The fatty acid profile of bread enriched with linseed oil shows a shelf life of five days. Fatty acids of bread enriched with linseed oil remained stable for 5 days after baking and had more omega-3, higher sensory and rheological scores than fish oil bread.

Fatty acids of bread enriched with linseed oil remained stable for 5 days after baking and had more omega-3, higher sensory and rheological scores than fish oil bread. It is suitable for production, but because the sensory and rheological points of this bread have decreased over time, so flaxseed bread is suitable for production and consumption on the first day of baking.

Bread enriched with fish oil, both on the first day of baking and on the fifth day of storage, has a low score and is not suitable [23-25].

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