INFLUENCE OF SOY FLOUR IN BAKED PRODUCTS

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Abstract

Adding of chronic diseases has increased the interest of researchers in the production of food products with biological balanced value. The purpose of this study is to increase the nutritional value of bread produced with soybean flour mixture, and the determination of the optimal level of harmonization with flour produced in our country and from import. The ability to produce an acceptable and appropriate bread rely on interactions between starch and gluten, and other ingredients. In this study, it shows the chemical-technological effect of soybean mixtures in reports 7%, 12%, 16% and 22%. Tests with pharinograph have shown some changes in the incorporation of soy flour with wheat flour, such as increasing of water absorption and dough weakening. Mixing time remains constant at low levels of soy flour content. High percentages show a molecular stickiness in the dough, which makes treatment more difficult. In high concentrations also have a decrease in the bread volume, while measures and humidity increases with increasing the amount of soya flour. Our results confirm that the harmonization of soybean with wheat flour in bakery products increases the amount of protein, which increases the content of iron, calcium, zinc and components with high biological value.

Key words: soy protein, bakery products, food quality, physico-chemical parameters.

1. Introduction

Using of soy flour is valued not only as a corrective of bakery product, but also have a positive effect on health. Soy flour contains more than 38% protein, so that the addition of soy in grain products, such as bread, increases the amount of protein in food [9].

Bread is a major food in many countries, so the addition of soy bread, will improve the quantity and quality in the diet of the population. The nutritional value of the final product is increased and completed by the combination of amino acids (gluten) with soybean. Soybean protein has a relatively high content in lysine and low in methionine. Gluten, like all cereal proteins, has a low content of lysin, but is relatively rich in cysteine, where our organism turns into methionine. Mixing of the two proteins is quite preferable. Adding 3 - 12% of soy flour increase dough water absorption and improves product elasticity, crust and color, that is the effect of β-carotene which is a lipid that is found in soybean. Tests, at the level of concentration 7% soybeans, have shown that the final product has high flexibility, color and desired crust. Also, soy is an excellent source of vitamins and minerals [16,6].

Soybeans are called as protein, because it provides high amounts of amino acids needed these to build and regenerate of body tissue. Soybean is rich in Lecithins on level 3% that is beneficial for brain development. It is also rich in Ca, P, and vitamins A, B, C and D. Soybean flour has a low carbohydrate content and high in protein, compared to other flour [15,17].

2. Materials and methods

For the production of bread by soy flour is used the flour produced from cultivars: Henry (Ukraina), Erna (Russia), and national cultivar Agimi (Lushnje), and soybean flour was procured from the local market and then washed thoroughly in teri water; also is used salt, yeast, and food additives [5,20]. Analysis of raw materials and bread products are performed in the laboratory of Vora flour factory, and the laboratory of Miell Tirana factory, using AACC 2000 method [2].

To perform these experiments was used:

- 8 Reference samples - were produced food without the use of soybean flour;

- 8 bread samples with 7% soybean flour and food additives;
- 8 bread samples with 12% soybean flour and food additives;
- 8 bread samples with 16% soybean flour and food additives;
- 8 bread samples with 22% soybean flour and food additives.

Analyses used are performed according to the AACC method (2000), where includes the following parameters: humidity (Method No. 44-15 A), ash (method No. 08-01), fat in bran (Method No. 30-10), proteins in bran (method No. 46-10), and bran fibers (method No. 32-10) [4, 13].

3. Results and analysis

3. 1Quality indicators of wheats for study

Reference bread is prepared by mixing with wheat flour 35% Henry, 30% Erna, and 35% Agimi (Table 1). The table 1 shows that harmonization of wheats has been made to obtain flours that meet the quality and cost [10]. Flour produced according to the harmonizations determined, were treated with soybean flour as follows:

1. T_0 = wheat flour with 0% soybean flour;
2. T_1 = wheat flour with 7% soybean flour;
3. T_2 = wheat flour with 12% soybean flour;
4. T_3 = wheat flour with 17% soybean flour;
5. T_4 = wheat flour with 22% soybean flour.

By data in Table 2 show that the highest moisture content it has the wheat flour without mixing (12.6%) and the lowest it has the flour by a mixture (22%), while proteins have a high growth that reach from 14.6% to 22.2%; likewise has a growing of sediment and water absorption because soybean flour has a high percentage of protein [1**Error! Reference source not found.**].

Farinograph Studies: Farinographic parameters (Table 3) such as water absorption, advent time, dough development time, dough stability time, and mixing tolerance index were studied under the influence of different doses of soybean flour and additives used (graphics 1, 2, 3, 4 and 5).

Table 1: Content quality of wheat for study

Cultivar of Wheat	Wheat qualities								
	Hectoliter Weight (kg/HL)	Humidity (%)	Protein (%)	F.N (sek)	Amylase AU	Gluten (%)	W (P/L)	Index (%)	Sedimentation
Henry	78.4	11.1	11.8	347	600	23	200	97.5	3033
Erna	78.2	11.67	14	406	400	29.7	300	94.5	3638
Agimi	76	13.7	13.8	531	700	28	210	95.5	3446

Table 2: Qualitative data of flours that are mixed with soy flour

Treatment	Humidity (%)	Proteins (%)	Humidity	Ash (%)	Water Absorption	Hardness
T_0 = wheat flour with 0% soybean flour	12.6 (±0.162)	14.6 (±0.37)	106 (±1.35)	0.64 (±0.02)	63.6 (±0.32)	49 (±0.748)
T_1 = wheat flour with 7% soybean flour	12.1 (±0.50)	17 (±0.77)	119 (±1.16)	0.76 (±0.02)	65.4 (±0.36)	50 (±0.80)
T_2 = wheat flour with 12% soybean flour	11.9 (±0.50)	18.7 (±0.33)	129 (±1.07)	0.83 (±0.01)	66.4 (±0.411)	51 (±0.829)
T_3 = wheat flour with 17% soybean flour	11.7 (±0.713)	20 (±1.41)	136 (±0.732)	0.89 (±0.01)	67.3 (±0.649)	52 (±1.98)
T_4 = wheat flour with 22% soybean flour.	11.5 (±0.465)	22.2 (±0.75)	147 (±0.66)	0.97 (±0.08)	68.6 (±0.549)	53 (±0.75)

Table 3: Measurements of Farinographic characteristics

Treatment	Water absorption (%)	Development time (min)	Stability (min)	Softness (PE)	Maximum (PE)
T_O	64.5 (±1.19)	2.2 (± 0.07)	4.5(±0.17)	128(±2.28)	493(± 1.70)
T_1	65.5 (±1.2)	1.6 (±0.05)	6.3(±0.09)	96 (±2.63)	507(± 2.11)
T_2	68 (±1.85)	1.4(± 0.06)	8.0(±0.14)	82 (±1.89)	509(±1.97)
T_3	70.0(±1.43)	6.5(± 0.16)	9.9(±0.17)	103(±1.69)	530(±2.98)
T_4	72.5(±1.41)	6.2 (±0.09)	9.9(±0.17)	83 (±1.39)	544(±3.63)

The Farinographic parameter of water absorption does increase proportionally with increasing concentrations of soybean flour food additives used; maximum water absorption is 72.5% in T4 (22 % soy flour) followed by 70.0 % in T_3 (17 % soy flour), while the minimum value for the parameter is calculated based control, e.g. 64.5 % [14].

Time of dough advent at all treatments increases with the amount of soy flour when it reaches over 17% soy flour. In harmonization with 12% soy flour dough advent time resulted in 1.6 (± 0.05) min; it increased 6.5 (± 0.16) min when the mixture reached about 17%. At level 12% (compared with mixing 7%) there is a deterioration in data of farinographic values, such as water absorption, dough development etc., while at mixing 16 - 22% soy flour have a deterioration of organoleptic indicators also [14,3].

By the analysis of physical-chemical parameters it is estimated total volume of bread, specific volume, weight, moisture content and other parameters, which had changed with increasing concentration of soybean flour [**Error! Reference source not found.**].

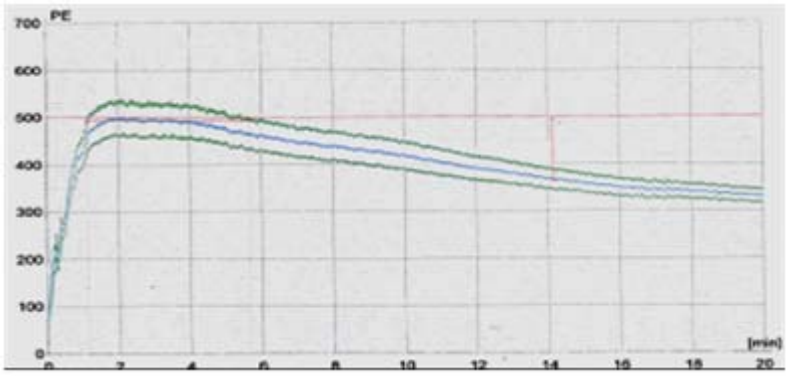

Figure 1: - Reference flour

Where: water absorption: 64.5%; development time: 2.2%; stability: 4.6%; softness: 128 PE; maximum: 493 PE.

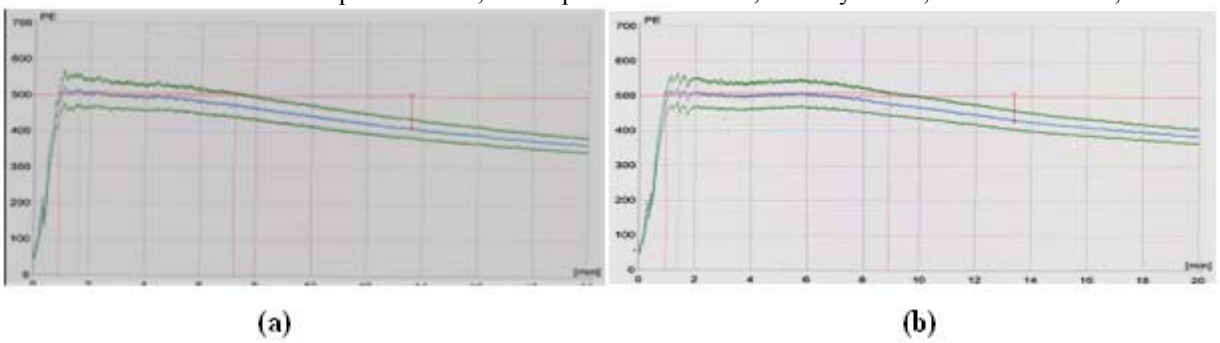

Figure. 2 - Flour containing (a) 7% soy flour and (b) 12% soy flour

Where: water absorption: 65.5%; development time: 1.6%; where: water absorption: 68%; development time: 1.4%; Stability: 6.3%; softness: 96 PE; maximum: 507 PE. Stability: 8.0%; softness: 82 PE; maximum: 509 PE.

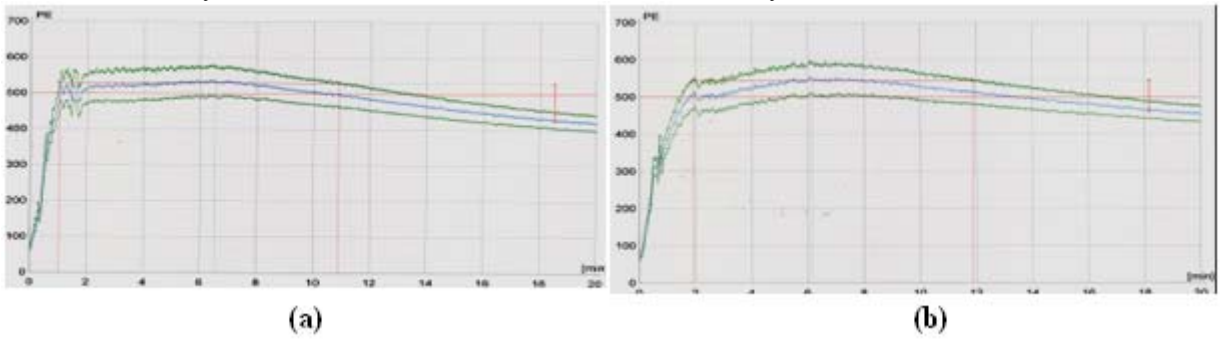

Figure 3: - Flour containing (a) 16% soy flour and (b) 22% soy flour

Where: water absorption: 70%; development time: 6.5%; where: water absorption: 72.5%; development time: 6.2%; Stability: 9.9%; softness: 103 PE; maximum: 530 PE. Stability: 9.9%; softness: 83 PE; maximum: 544 PE.

Table 4: Presentation of final product

Treatment	Water absorption (Ml)	Volume
T_0	580	18
T_1	640	15
T_2	660	12.5
T_3	710	9.7
T_4	730	8.3

Table 5: Organoleptic parameters of bread production

Treatment	**Dough production**	**Fermentation**	**Oven**	**Porosity**	**Color**
T_0	Very good	Very good	Very good	Very good	White
T_1	Very good	Very good	Very good	Good	Cream
T_2	Very good	Very good	Good	Weak	Yellow
T_3	Weak	Weak	Weak	Weak	Yellow
T_4	Bad	Very weak	Bad	Weak	The yellow highlighted

The physical data of the table 4 shows that with the increase of soybean flour water absorption is increased and the volume is decreasing (Table 4 and figure 4) [8].

Sensory analysis: By the evaluation of organoleptic parameters seems clear that the breads with containing soy flour 7% is more liked by the consumer (Table 5) [3,8]. In this context all physico-chemical parameters are at the right level and very pleasing. Bread has appropriate elasticity and desirable stability. Breads containing soybean at level 16-22% are darker than wheat breads that contained 7% and 12% soy flour [8].

This has to do with increased of carotenoid pigments in soybean flour. Starting with the level of 7% soybean flour, a decrease of volume is observed, but this was corrected by adding sodium, 0.5% stearoyl-2-lactylate (SSL) [7,19]. At levels of 12, 16 and 22% soy flour, SSL was not effective in preventing the decrease in the volume. Soybean flour contains reduced carbohydrate, non-fermentable. During baking phase they contribute at the brown color of the crust produced [11,12].

Figure 4: View from bread produced with soy flour , - 7% - 12% - 16% - 22%.

4. Conclusions

This study was conducted in order to improve food rations through the production of bakery products enriched with soybean flour, and increasing consumption of protein levels in food diets. According to this study, soy flour used in percentages determined is a very good source of proteins, fibers and other components that affect in cholesterol reduction and have anti carcinogenic effects. Knowing the characteristics of the soybean and its use in foods is increased at high levels last years.

Bakery products seem to be a good tool to use soybean protein by the customer. Good using of soy flour, reference to the rates taken in the study, maintains organoleptic and technological values in bakery products. Organoleptic evaluation of bread that are taken in the study discovered that there are significant differences between the percentages of harmonization at organoleptic qualities such as taste, color, quality, etc. (Table 2). Taste is the main factor that determines the acceptability of any product, flavor score is decreased with the increase of soy flour percentage at 20%.

The results of this study discovered that the bread produced with soybean flour, to the extent 22%, are with higher quality than the bread produced only with wheat flour (flour reference).

To get bread with high nutritional and organoleptic qualities, wheat flours used in this study, are recommended to be replaced to the extent 7% with soybean flour. Bread containing 88% wheat flour and 12% soybean flour can provide the daily nutritional requirements because these breads contain 9.9% protein, 20% fat and 453.6 kcal.

5. References

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