

The Optimal Quantities Usage Of Soy Flour In The Qualitative Bread Evaluation

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Abstract

The purpose of this study, is studying the replacement effect at a certain percentage of flour with soy flour, which will impact nutritional bread quality and rheological dough characteristics. Adding soy proteins in wheat flour, in breads productions increases proteins content and aminoacids balance in foods.

In this study is determinated the optimal level of harmonization with flour produced in our country and from import. The ability to produce acceptable and appropriate bread relies on interactions between starch and gluten, and other ingredients. In this study, it is show the chemical-technological effect of soybean mixtures in reports 8%, 11%, 15% and 21%. 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 shows 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.

Keywords: soy protein, rheological, bakery products, bread quality.

INTRODUCTION

The addition of soy protein to wheat flour increases the protein content and improves the amino acid balance in the food, providing a more nutritious product. This is especially significant for consumers with a limited protein intake who obtain the majority of their dietary protein from bread. 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. 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. Mixing of the two proteins is quite preferable. Adding 3 – 11% 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 8 % soybean, 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].

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].

MATERIALS and METHODS

For the production of bread by soy flour is used the flour produced from cultivars: Apache, Ankora, and national cultivar Agimi (Lushnje), and soybean flour. Then it's 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 were used:

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

9 bread samples with 8% soybean flour and food additives;

9 bread samples with 11% soybean flour and food additives;

9 bread samples with 15% soybean flour and food additives;

9 bread samples with 21% soybean flour and food additives.

Analyses used are performed according to 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].

RESULTS AND ANALYSIS

3. 1Quality indicators of wheats for study

Table 1. Content quality of wheat for study

Cultivar of wheat	Wheat qualities								
	Hectolitre Weight (kg/hL)	Humidity (%)	Protein (%)	F.N (sek)	Amilase AU	Gluten (%)	W (P/L)	Index (%)	Sedimentation
Apache	78.3	11.2	11.7	341	600	24	200	97.5	3033
Ankora	78.2	11.68	14	402	400	29	240	94.5	3638
Agimi	76	13.7	13.8	460	650	28.5	210	95.5	3446

Reference bread is prepared by mixing with wheat flour 35% Apache, 30% Ankora, 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:

- T_0 = wheat flour with 0% soybean flour;
 T_1 = wheat flour with 8% soybean flour;
 T_2 = wheat flour with 11% soybean flour;

- T_3 = wheat flour with 15% soybean flour;
 T_4 = wheat flour with 21% soybean flour.

By data in Table 2 show that the highest moisture content it has the wheat flour without mixing (12.5%) and lowest it has the flour by mixture (21%), while proteins have a high growth that reach from 14.7% to 22.3%; likewise has a growing of sedimentation and water absorption because soybean flour has a high percentage of protein[18]

Table 2. Qualitative data of flours that are mixture with soy flour

Treatment	Humidity (%)	Proteins (%)	Humidity	Ash (%)	Water absorbtion	Hardness
T_0 = wheat flour with 0% soybean flour	12.5 (±0.162)	14.7 (±0.37)	105 (±1.35)	0.64 (±0.02)	59.6 (±0.32)	49 (±0.748)
T_1 = wheat flour with 8% soybean flour	12.1 (±0.50)	17 (±0.77)	118 (±1.16)	0.76 (±0.02)	63.4 (±0.36)	50 (±0.80)
T_2 = wheat flour with 11% soybean flour	11.9 (±0.50)	18.7 (±0.33)	128 (±1.07)	0.83 (±0.01)	65.4 (±0.411)	51 (±0.829)
T_3 = wheat flour with 15% soybean flour	11.7 (±0.713)	20 (±1.41)	135 (±0.732)	0.89 (±0.01)	66.9 (±0.649)	52 (±1.98)
T_4 = wheat flour with 21% soybean flour.	11.5 (±0.465)	22.3 (±0.75)	146 (±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_0	61.1 (±1.19)	2.2 (± 0.07)	4.5(±0.17)	128(±2.28)	493(± 1.70)
T_1	62.1 (±1.2)	2.3 (±0.05)	6.3(±0.09)	96 (±2.63)	507(± 2.11)
T_2	64.5 (±1.85)	2.4(± 0.06)	8.0(±0.14)	82 (±1.89)	509(±1.97)
T_3	68.0(±1.43)	4.5(± 0.16)	9.9(±0.17)	103(±1.69)	530(±2.98)
T_4	71.2(±1.41)	6.2 (±0.09)	9.9(±0.17)	83 (±1.39)	544(±3.63)

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).

Farinographic parameter of water absorption does increase proportionally with increasing concentrations of soybean flour food additives used; maximum water absorption is 71.2% in T₄ (21 % soy flour) followed by 68.0 % in T₃ (15 % soy flour), while the minimum value for the parameter is calculated based control, e.g. 61.1 % [14].

Time of dough advent at all treatments increases with the amount of soy flour when it reaches over 21% soy flour. In harmonization with 11% soy flour dough advent time resulted in 2.4 (\pm 0.06) min; it increased 4.5 (\pm 0.16) min when the mixture reached about 15%. At level 11% (compared with mixing 8%) there is a deterioration in data of farinographic values, such as water absorption, dough development etc, while at mixing 15 - 21% soy flour have a deterioration of organoleptic indicators also [14,3].

By the analysis of physico-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 [1].

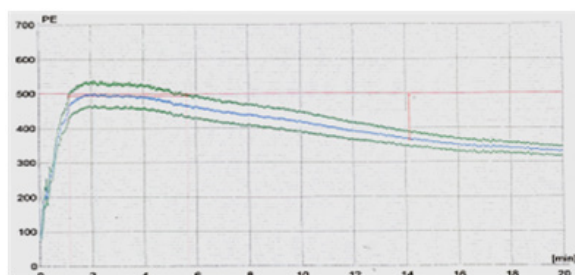


Figure 1. - Reference flour where: water absorption: 61.1%; development time: 2.2min; stability: 4.5min; softness: 128 PE; maximum: 493 PE.

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	Crem
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

Sensory analysis: By the evaluation of organoleptic parameters seems clear that the breads with containing flour soje 8% 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 15-21% are darker than wheat breads that content 8% and 11% soy flour [8].

This has to do with increased of carotenoid pigments in

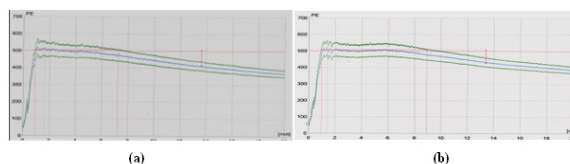


Figure 2. - Flour containing (a) 8% soy flour and (b) 11% soy flour water absorption: 62.1%; development time:2.3; where: water absorption: 64.5%; development time: 2.4 stability: 6.3min; softness: 96 PE; maximum: 507 PE. stability: 8min; softness: 82 PE; maximum: 509 PE.

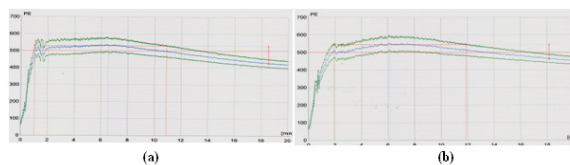


Figure 3. - Flour containing (a) 15% soy flour and (b) 21% soy flour where: water absorption: 68.%; development time: 4.5; where: water absorption: 71.2%; development time: 6.2; stability: 9.9; softness: 103 PE; maximum: 530 PE. stability: 9.9; softness: 83 PE; maximum: 544 PE.

Table 4: Presentation of final product

Treatment	Water absorption (ml)	Volume
T ₀	582	18
T ₁	645	15.2
T ₂	667	13.4
T ₃	713	12.2
T ₄	734	8.3

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

soybean flour. Starting with the level of 8% 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 11, 15 and 21% soy flour, SSL was not effective in preventing the decrease in the volume. Soybean flour contains reduction carbohydrate, non-fermentable. During baking phase they contribute at brown color of the crust product [11,12].



Figure 4. View from bread produced with soy flour , - 8% - 11% - 15% - 21%.

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 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 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 21%.

The results of this study discovered that the bread produced with soybean flour, to the extent 21%, 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 8% with soybean flour. Bread containing 89% wheat flour and 11% soybean flour can provide the daily nutritional requirements because these bread contain 9.9% protein, 20% fat and 453.6 kcal.

REFERENCES

- [1] Anderson J W, Johnstone B NI, Cook –Newell NI.E: Meta-analysis of the effects of soy protein intake on serum lipids. *N. Engl. J. Med.* 1995,333:276.
- [2] AOAC, Official methods of Analysis, Association of Official Analytical Chemists, Washington DC, New York USA, 2000.
- [3] Dhingra S and Jood S,: Organoleptic and Nutrition Evaluation of wheat breads supplemented with soybean and barley flour. *Food Chem.*2000, 77:479-488.
- [4] Drejtoria e Përgjithshme e Standardizimit: Katalogu i standarteve shqiptare, 2005.
- [5] Eating soya improves your health. *Intl. Food Marketing and Technol.* 1996,10:5
- [6] FAO. Nutritional Status of the Children: Assessment of Malnutrition in Third World Countries. *FAO Bulletin* 2007,No - 24: 12-34.
- [7] French F. Bakery uses of soy products. *Baker's Dig.* 1977,5 1:98-106.
- [8] Healthful attributes spur soy consumption. *Prepared Foods* 1997, 166:107-114

[9] Hegstad HG: Nutritional and Health benefits of Soybean. Soy Protein Quality Evaluation Report, Food and Agriculture Organization of the United Nations, Food and Nutrition Paper No. 71, 2008 Rome, Italy.

[10] Hoover, W. Use of soy proteins in baked foods. *J. Am. Oil Chem. Soc.* 1979,56:301-308

[11] Lutzow S. Better, healthier baking with soy. *Bakery Prod, and Marketing* 1996, 31:16-22

[12] Onayemi O, and Lorenz K. Concentrates and isolate in bread making. *Bakers Dig.*1978, 52:18-25

[13] Shogren NI D, Pomeranz Y, and Finney F. Counteracting the deleterious effects of fibers in breadmaking. *Cereal Chem.*1981, 58:142-150

[14] Sipos E S. Edible Uses of Soybean Protein. *American Soybean Association Bulletin*, 1994.

[15] Smith A K, and Circle S J. *Soybean Chemistry and Technology*, vol. 1. Proteins Ave. Publishing Co. Inc., Westport, CT, 1972.

[16] Soy in white bread. *Soy Protein Products Bulletin.* Cargill Foods (2), 1997.

[17] Soy Protein Council. *Soy Protein Products. Characteristics, Nutritional Aspects and Utilization.* SPC, Washington, DC,1987, 26-32

[18] Tsen C C . and Hoover W J. High protein bread from wheat flour fortified with full fat soy flour. *Cereal Chem.*1973, 50:7.

[19] Tsen C C. Farrell E. P, Hoover W J, and Crowley P R. Extruded soy products from whole and dehulled soybeans cooked at various temperatures for bread and cookie fortification. *Cereal Foods World* 1975,20:4 13.

[20] Zind T. Soy to the world. *Prepared Foods* 1988,167:55-63