BREAD PRODUCTS FORTIFIED WITH PROTEINS AND THEIR BENEFITS TO OUR HEALTH

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Abstract

Being an essential link between the man and the environment and the main condition of his existence, aliments can help in the normal development of metabolism, material and energetic or, on the contrary, they can disturb it unless they correspond to some well definite conditions, meant to assure the quality and security of the food and of man's nourishment. Aliments don't contribute only to health maintenance and an optimal development, but they can have an important role in reducing the risk of getting sick. Bread fortified with exogenous proteins has a benefic effect for health, in preventing sickness, especially the proteic malnutrition, being recommended to big groups of individuals at whose level an unequivocal insufficiency in proteins is detected, as well as an inadequate and unbalanced contribution in essential amino acids.
***Keywords**: food quality, consumer's security, risks, fortified products, exogenous proteins, inadequate proteic contribution, unbalanced contribution of essential amino acids.*

Introduction

Man's concerns with food issues are as old as his existence. The ways in which these concerns have manifested were very different, in relation to the historical periods of development. The thing that has always remained is food necessity: "we eat in order to live". Today, the scientific conception and practice of nourishment tends more and more to add to this aphorism a new significance: "we eat in order to live in good health" (Lungu, C., 1999). An adequate nourishment, inoffensive, of good quality from the point of view of sanitation and loyalty, is essential in order to reach an acceptable level of life. This requirement is proclaimed in the Universal Declaration of Human Rights, adopted by The United Nations Organization, on December 10, 1948 (Dima, D., 2004).

The main role of nourishment is to supply with the proper nutrients and in a satisfactory quantity for the metabolic needs of the body and, in addition, to offer the consumer a feeling of satisfaction and pleasure through the aliments' qualities. Besides the nutritive effects, the diet can also have benefic physiological and psychological effects. The quality of the alimentary act is essential for the state of the individual's health. Consumers' warning regarding the relation between food and health is, worldwide, in an evident increase. Consumers start realizing that the food they consume has to be a benefit to their health (Costin, G.M., 1999).The creation of some products that assure benefits to our health is relative recent and it represents the result of the acceptance of the idea that nourishment plays a determining role in preventing and healing some diseases. This new conception in motivating for the development of some new food products has mobilized many factories, as well as organizations involved in assuring the food innocuity, in a complex action of understanding of the issues which have appeared in a new field (health risks, the analysis of the ratio of risks/benefits, the evaluation of the efficacy and toxicity, sanitation rules).

In EU there is no coherent legislation regarding the health claims, these being described at national level. However, it is specified that the competitive position of food and beverage industry from the UE countries can be consolidated through a better understanding of the scientific basis of the functional aliments.

For practical aims, functional aliments can be grouped in two categories:

a. functional aliments intended to prevent some diseases;

b. functional aliments intended to therapeutic treatment, for example, to correct some metabolic diseases or to prevent the development of some diseases or even their recurrence (Costin, G.M. 1999).

In the category of functional aliments also enter bread products fortified with different proteins of exogenous nature, these being connected to the population from the unfavoured areas, but not only, taking into account their direct benefits to the body.

Bread products fortified with exogenous proteins, like any other functional aliment, answer the following demands:

- they contribute to the improvement of food habits and to health maintenance and development;
- the testing methods of the physical-chemical properties of the components are well defined, as well as methods for the qualitative and quantitative determination of those;
- the other nutritive components of the product are not in concentrations significantly smaller compared to those from similar products;

- the product is an usual aliment consumed in usual forms, daily, not occasionally (Costin, G.M. 1999).

Experimental

The flour used in this study was a 650 white flour, as a result of milled wheat from Triticum Aestivum L., in S.C. Boromir Prod Mill Buzău. Before being used in this analysis, the quality of flour was tested in mill and the results may show that flour has a medium quality, a relative low amylase activity, with poor capacity of fermented glucides formation.

For content standardization of α-amylase , flour was improved in mill by adding 3g α-amylase at 100 kg flour.

For a better quality of the flour, also for better mixing dough capacity, high dough extensibility, low negative effect of insoluble hemicelluloses on the gluten film continuity, 10g hemicelluloses at 100 kg wheat flour was added. For a better strength of gluten network, ascorbic acid was added.

In this study those protein additions were used: soy degreased flour without enzymatic activity (PROVABIS), lupine protein concentrate (LUPIDOR P 52-H 125) and sodium caseinate (EM6), those main physical and chemical parameters are indicated in table 1. Each source of protein was added into witness flour in different concentrations of 3, 5, 10 and 15%, studying the influence of those additions on the protein value of bread.

The quality evaluation of proteins consisted in the analysis, by liquid chromatography of high performance (RP-HPLC), of bread samples obtained from the fortification of wheat flour with exogenous proteins. A Hewlett-Packard HP 1050 series system equipped with a programmable autoinjector capable of performing the precolumn derivatization step was used.

Table 1: Chemical parameters of protein additions

Component	U.M.	Protein additions		
		Soy degreased flour without enzymatic activity	Lupine protein concentrate	Sodium caseinate
Proteins	%	min 52	48 +/- 2	89,5
Fat	%	+/- 1,5	5 +/- 1	0,8
Ash	%	max 7	max 4	4,5
Moisture	%	8	6 +/- 1	5

Results and Discussion

The protein contribution of bread fortified with exogenous proteins registered a growing evolution with the increase of the quantity of used proteic addition. The results are presented in table 2.

As expected, the content of all amino acids increased with the increasing of the quantity of used protein addition. To analyse the efficiency of bread fortifications with semi-conventional proteins, the amino acid content of the fortified samples, expressed like dried substance, was compared to the essential amino acids content of FAO protein.

Table 2: The protein content of products fortified with leguminous exogenous proteins

Source of exogenous protein	UM	Control sample	The protein content of fortified samples, [%]			
			3%	5%	10%	15%
Soy degreased flour	%	10,20	11,31	11,97	13,00	14,25
Lupine protein concentrate	%	10,20	11,03	11,65	12,58	13,91
Sodium caseinate	%	10,20	11,37	13,71	17,38	20,25

It can be observed that the limitant amino acids of the samples fortified with sodium degreased flour remain the lysine and the threonine, although their deficit decreases through fortification. So the covering proportion of the lysine, compared to FAO protein, increases from 32,64%, according to the unfortified sample, to 56,44%, according to the sample fortified with 15% soy degreased flour (table 3). Taking into account the maximum admitted technological limit, namely the fortification with the maximum of 10% soy degreased flour, the covering proportion of lysine, compared to FAO protein, cannot exceed the value of 53,80% (Constandache, M., 2006). The covering proportion of the threonine, compared to FAO protein, increases from 77,25%, according to the unfortified sample, to 92,13%, according to the sample fortified with 15% soy degreased flour, the maximum fortification technologically admitted, with 10% soy degreased flour, limiting this increase to 87,00 % (table 3).

The limiting amino acids of the products fortified with lupine proteic concentrate remain the lysine and the threonine, although part of their initial deficit is covered through fortification. So the products fortified with lupine proteic concentrate assure between 32,64% from the FAO recommended lysine necessaries, in the case of the unfortified sample, and respectively 44,07%, in the case of the sample fortified with 15% protein addition. Because the maximum technologically admitted concentration for the lupine proteic concentrate fortification is of only 5%, the products fortified in this way cannot assure more than 36,91% from the FAO recommended lysine necessaries (Constandache, M., 2006).

Table 3: The covering proportion of the essential amino acids content of FAO protein by the samples fortified with exogenous semi-conventional proteins

Proteic addition [%]	The covering proportion of FAO protein content, [%]							
	Thr	Tyr+ Phe	Val	Ile	Leu	Lys	Cys + Met	Trp
Soy degreased flour								
control	77,25	154,05	97,48	105.73	120.26	32,64	124.66	121,10
3%	82,55	155,60	97,90	106.53	120.53	33,51	125.31	121,90
5%	83,58	155,63	98,28	106.95	120.61	40,25	125.49	123,10
10%	87.00	155.65	98.60	107.15	120.93	53.80	151.89	124,60
15%	92.13	155.78	98,82	107.48	121.20	56,44	152.83	124,90
Lupine protein concentrate								
control	77,25	154,05	97,48	105.73	118.99	32,64	119.54	109,40
3%	81,78	154,27	97,60	106.23	120.00	33,16	121.83	114,60
5%	82.38	154,70	97,66	106.40	120.16	36,91	122.29	117,90
10%	84,90	154,82	97,78	106.95	120.29	39,53	122.71	119,60
15%	85,35	154,98	98,06	107.18	120.47	44,07	122.83	121,60
Sodium caseinate								
control	77,25	154,05	97,48	101.93	122.34	32,64	111.20	111,00
3%	90,28	154,32	97,66	102.45	123.71	45,91	114.03	111,10
5%	90,33	154,78	100.54	104.38	123.89	60,07	114.43	112,70
10%	90,70	156,25	107.56	112.23	132,09	65,91	114.54	113,50
15%	96,53	156.37	115.66	113.18	132.21	72,75	114.60	113,90

Bread products threonine deficit is much more reduced, and its covering proportion through fortification is higher. So, the unfortified products offer only 77,25% from the FAO recommended threonine necessaries, through fortification with lupine proteic concentrate covering only the maximum of 85,35% from the necessaries. Because, due to technological reasons, a lupine proteic concentrate fortification in concentrations higher than 5% cannot be obtained, the obtained products will cover only 82,38% from the FAO recommended threonine necessaries.

The limiting amino acids of the products fortified with sodium caseinate remain the lysine and the threonine, although part of their initial deficit is substantially covered through fortification. So the products fortified with sodium caseinate assure between 32,64% from the FAO recommended lysine necessaries, in the case of the unfortified sample, and respectively 72,75%, in the case of the sample fortified with 15% protein addition.

Because the maximum technologically admitted concentration for the sodium caseinate fortification is of only 10%, the products fortified in this way cannot assure more than 65,91% from the FAO recommended lysine necessaries (Constandache, M., 2006).

Bread products threonine deficit is much more reduced, and its covering proportion through fortification is higher. So, the unfortified products offer only 77,25% from the FAO recommended threonine necessaries, through fortification with sodium caseinate covering only the maximum of 96,53% from the necessaries. Because, due to technological reasons, a sodium caseinate fortification in concentrations higher than 10% cannot be obtained, the obtained products will cover only 90,70% from the FAO recommended threonine necessaries.

Conclusion

An increase of all essential amino acids content was observed at the same time with the concentration increase of used protein addition. One can observe that the limiting amino acids of the samples fortified with leguminous exogenous semi-conventional proteins remain the lysine and the threonine, although their deficit decreases through fortification. By examining the amino acids content of samples fortified with exogenous protein sources corresponding to the maximum technologically admitted concentrations, one can observe the fact that lysine deficit was the best recovered in the case of wheat flour fortification with sodium caseinate, followed by soy degreased flour. The lowest lysine contribution was obtained in the case of wheat flour fortification with lupine proteic concentrate.

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