OPTIMIZING THE CONTENT OF ESSENTIAL AMINO ACIDS IN EDIBLE FLOURS OBTAINED FROM CEREALS AND LEGUMINOUS GREEN

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Abstract

Aminoacids have an essential role in the fuction of the human metabolism. The most important saturated aminoacids, which are the main component of the proteins. There are 18 aminoacids designated as essential which can not be synthesized in the human organism. This is why they should be asured via noutrishment.The amino acids essential are : valine, leucine, isoleucine, phynilalanine, threonine, lysine, tryptofan, methionine, for the adults, and in the case of the childre we can added the glutamine and histidine. Amino acids are synthetized only bz the vegetable, specially from the grains. The level of amino acids are recommended by FAO and the assimilation of them are very important for the organism. In this study we watching by compare the level of amino acids from the flours obtaining from the wheat, rye, corn, barley, buck-wheat, rice, soya beans, lentil, peas. The level of nutrients of the food products generates the quality of them and the essential method for the resolving of the consumer's. The quality of food products is a means used for a certain purpose, according to which a company or an economic agent exists on the market and it can remain competitive continuously although it develops in a changing environment. The study welcome of the actual tendency by the supplementing of the processing food.

Key words: essential amino acids, nutrition, food safety

INTRODUCTION

Foods may contribute to maintaining the health on a long term basis, in ways not recognized until now, which means a new dimension of appreciation of how food can positively influence the health and welfare of the people, beyond providing the nutrients needed. Research results have shown that consumers are beginning to attach greater importance to healthy eating. Most consumers have considered it very important to permit health claims for functional foods by authorized agencies (74.29%), the need for scientific support of health benefits (64.94%) and their communication to the public (89.35%). (Mihaela Constandache, Elena Condrea 2010).

A growing number of consumers perceive the ability to control their health by improving their present health and/or hedging against aging and future disease. These consumers create a demand for food products with enhanced characteristics and associated health benefits. In one study, 93% of consumers believed certain foods have health benefits that may reduce the risk of disease or other health concerns. In addition, 85% expressed interest in learning more about the health benefits offered by functional foods.(*** International Food Issues & Resources, 2007).World market growth in the natural health products, nutraceutical and functional food industry is being driven by demographic, economic and social trends. The key factors driving this growth in demand, as well as and changes in the supply chain, include: aging populations, particularly the large baby boom generation; increasing interest in healthy living; increasing affluence and education among world populations; increasing understanding of the link between nutrition and health; emphasis on preventative measures to control health care costs;increased acceptance and utilization of alternative treatments;rising acceptance among doctors, pharmacists and other health professionals; expanding body of scientific and clinical research to validate effectiveness and safety; expanding press coverage of such research;increased marketing and advertising activities by suppliers; evolving public policy and regulatory environments (*** Potential Benefits of functional foods and Nutraceuticals to the Agri-Food Industry in Canada). Although functional foods are intended to modify physiological functions within the body in a positive way, their mode of action is to restore, reinforce or maintain normal body processes in ways consistent with normal physiology. They may restore or enhance body functions within normal ranges in order to optimise health and well-being or they may reduce factors known to be associated with the risk of contracting diseases(Howlet,J.,Functionalfoods2008).

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Functional food science is still at an early stage in its development. As knowledge about the functional effects of foods increases and the functionality of particular foods and food components is more extensively recognised, technology will have a continuing role to play in making those foods and food components more widely available and accessible. Basic education in nutrition will also have a continuing role to play in ensuring that the benefits of functional foods are understood by all stakeholders in order to ensure that the benefits are enjoyed to the full.(Mihaela Constandache, Elena Condrea 2010).

Amino acids are organic substances with essential role in the function of the human metabolism . This is why they should be ensured via nourishment. For the adults the essential amino acids are: valine, leucine, isoleucine, phenylalanine, threonine, lysine, tryptophan, methionine. In the case of the children we can add glutamine and histidine. Amino acids are synthesized only by plants due to the synthesizing of the plants by synthesizing the atmospheric or mineral nitrogen, and the animals are obtaining it from the plants. The level of amino acids are recommended by FAO and the assimilation of them are very important for the organism. In this study are watching by compare the level of amino acids from the bakery products enriched with insulated of peas and soy. One of the most efficient ways to increase the biological value of the bread proteins is representing by the use of raw material rich in essential nutrients, which together with the contribution to the aspect of their content rich in essential amino acids, can fortify the bread with phosphorus and calcium, isolated peas, deshidrated isolated soy.(Byrne C., Maher M.J., Hennerty, M.)

The quantitative contribution of the protein insulated from peas upon the protein value of the bread. One of the highest grow up of the bread protein content, explained by the considerable content in proteins of the exogenous protein source, was obtained due to the intensification of the wheat flower with insulated peas. The bread protein content has grown together with the increase of the protein insulated from peas percentage used for the intensification.

The highest values of the indications of essential amino acids EAA – Index were registered at the products intensified with isolated peas, followed by those fortified with soy degreased flour and protein insulated from peas.(Texeira S.,Potter S.M)

Very important are the values registered by the products fortified with soy degreased flour, (Mihaela, Constandache, 2010) which despite a smaller content of protein from the protein source, can be compared with those generated by the peas protein isolation, which explains the fact that the soy degreased flour ensures an optimal balance of the essential amino acids.

Research carried out towards the determination of levels of essential amino acids and un-essential for vegetable raw materials, which have been grown in ecological conditions. Experimental determinations shows that the use of raw materials such as: rice, barley, maize, peas, lentils, wheat and rye, have recorded the maximum value from lentils 24.8-25,8% of proteins which has 39.95% essential amino acids, to soyabeans 34.9% proteins which has 36,82% essential amino acids; the average values of rye flour whole 10.7% protein, essential amino acids, 32,28% to 11.6% values of buckwheat protein and essential amino acids, 32,99% and the minimum values of maize flour 9,1% protein, 35% essential amino acids. Comparative analysis of free amino acids in flours studied with the level of amino acids recommended by FAO provided that the richest flours in essential amino acids are: flour of soy beans, flour of lentils, and peas flour.

MATERIAL AND METHODS

The determination of content of amino acids used Kjeldahl method, Biuret method for hzstidine, serina, threonina and cromatographic method in high pressure liquid phase by molecular exclusion-is-HPLC. Separation of amino acids was made on the basis of the molecular weight, using chromatography, molecular masses of phases separated estimation using standard and quantitative determination of protein based on the area of the peaks and the amount of protein in the protein solution determined by Kjeldahl micromethod. So for the experimental device used is-HPLC (Waters, model LC module 1 plus) consist of the column, TSK G 4000 SW, column guard (precolumn), TSK 3000, 1000 SW, sofware detector ABI Lab-PC II.

The reagents were used: extraction solution of phosphate buffer, 0,1 n, sociu PH 6.9, containing ground 2% SDS, sodium dodecyl sulphate eluție buffer-buffer solution, 0 71n sodium phosphate, containing 0.1% SDS; standard protein reagents for the determination of proteins by the Kjeldahl method.

The apparent molecular weight of proteins separated, it is estimated by using standard proteins, which are introduced and they are eluted in the column and under the same conditions as the sample to be analyzed. The analysis is done using the sofware Chromatograms.

RESULTS AND DISCUSSIONS

Studies on the flours obtained from cereals and legumes grown under organic conditions at Iezareni Iasi county result the following aspects :

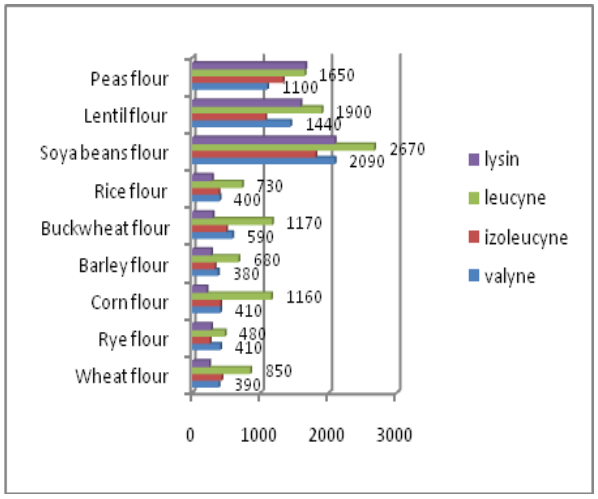

Figure1-Essential amino acids dynamics – valina, isoleucine and lysine in cereal

Soy flour recorded the largest values in Leucine -2670 mg and lysine - 1 900 mg, isoleucine-1850 mg, followed by flour lentil flour and peas. Leucine present average values edible flours of wheat-850 mg, peas - 1170 mg, buckwheat-1160- mg. The lowest values were edible flours: rye-480 mg, barley– 680 mg and rice -730 mg. (fig.2).

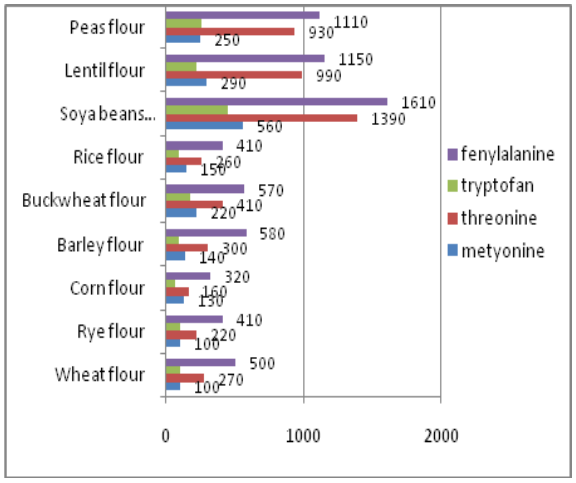

Figure 2 -Essential amino acids dynamics, threonine, leucine, tryptophan, methionine, phenylalanine to Edible flours

The maximum value register phenilalanine - 1610 mg at the soya beans flour. While the present average values obtained from the Edible flours: lentils1150 mg, peas –-400 mg. The lowest values are recorded as edible flours: wheat-500 m g, rye -490 mg, corn flour-410 mg, , buckwheat-400 mg, barley-550mg, rice--580 mg. The threonine amino acid register higer values for soya beans flour-1390 mg, average values of lentils, edible flours 990 mg, peas-960 mg. The lowest values are recorded as Edible flours: wheat270 mg, rye-250 mg, corn flour-220 mg, buckwheat -320 mg, , barley-350 mg and rice – 410 mg. The tryptophan register values for soybeans flour-410 mg, average values of lentils. (figure 1). The lowest values are recorded as Edible flours: wheat-100 mg, rye- -100, corn flour, buckwheat-130 mg/160 mg, barley, rice – 220 mg to 150 mg. In the case of methyonine register values for soybeans flour-560 mg. The lowest values are recorded as Edible flours: wheat, rye-100 mg, corn flour-160 mg, buckwhea– 130 mg t, barley -140 mg, rice – 220 mg. (figure 2)

Glutamic acid has the largest soyabeans flour 6050 mg, being followed by those of peas-3615 mg, and the flour of buckwheat-3400 mg. average values can be observed in the wheat flour, 3080 mg- lentils-2890 mg, rice flour-2370 mg. In the case of other amino acids prolina, serina, tyrosina and cysteine note minimum for all. Edible flours except soy meal at which the values are of 1860 mg. (figure 3).

The asparagic acid, glycine, arginine and Histidine maximum values recorded for soya flour between 980-820 mg, average values for edible flours of lentils between 700-2370 mg, peas – 700 mg.

Other minimum values between flour has 230-400 mg/100 g of flour. (fig.4). In the diagram you can see that the level of essential amino acids is lower than the level of un essential, so they have a higher weight than those essential. So in the case of essential amino acids share lentils is the largest 42,011%.(fig.5)

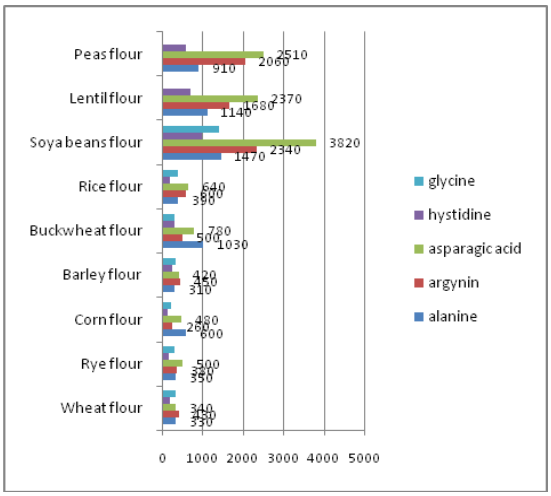

Figure 3 -Dynamics of unessential amino acids

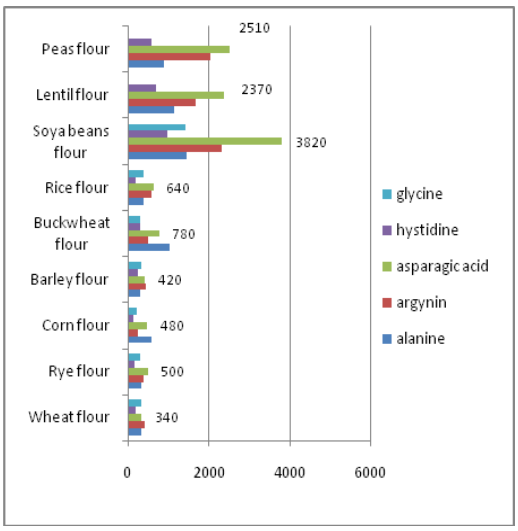

Figure 4 – Dynamics of alanine amino acids arginine, hystidine, asparagic acid and Glycine

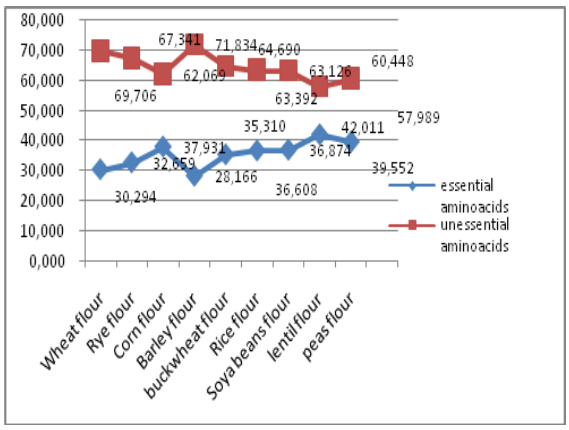

Figure 5 – Dynamics of essential amino acids and un essential

Weighted average values to be observed in rezults: edible flours 35,310% buckwheat, 36,608% rice, 36,874% at soy beans. The lowest note to wheat flour 30,294% and flour barley 28,166%. The amino acids unessential largest share a meal of barley 71,834%, being followed by Edible flours of wheat 69,706%, rye, buckwheat 67,341% 64,690% 62,069% of maize flour, edible flours of soybean and rice with a weight of around 63%.The smallest proportion were edible flours of peas 60,448%. Incidentally, it appears that the content of essential amino acids is inversely proportional to the content of amino acid unessentially which can be synthetizated by the human body. By comparing the total content of essential amino acids, which are not sintetizati by the body the weights for each type of amino acid in flour samples taken in the study. Thus, it sought to analyse the weights with FAO standard values.

Essential amino acids by comparison with the values recommended by FAO showed that: the flour is recommended for isoleucina content covered, leucine, tryptophan, cover draws by 100%. Other amino acids occupying a weight between 47,646% lysine and 87,352 phenilalanina.

In the case of rye flour shall be recorded against the standard for valine and tryptophane, isoleucine, leucine, phenilalanina, threonine and lisyne presents important values. Lowest value of a metionine area.

Flours and meals of corn will be standardized to values above the threshold, valine 108,75 isoleucine 135,94, leucine 219,78%. lysina, metionine and threonine is situated between 49,261-53,05, while phenilalanina and tryptophan have values of 70,734 and 79,576.

Barley-meal to be constant values below the standardizate of the FAO, with the maximum for leucine and phenilalanin. Overcoming the buckwheat is observed, isoleucine standard for valina, leucine and tryptophan.

Flour of rice will be over the maximum values for standard values, isoleucine, leucine, valine and other amino acids do not cover the standardized values. At the soyabeans flour 5 of the 8 essential amino acids have been higher than the standardized values. These are: leucine, isoleucine, valine, lysine and threonine. Lentil flour and peas flour are a similar situation as in the case of soybeans flours, with 5 essential amino acids with values that exceed the standard values. The first three amino acids that share the meal with soyabeans, and the other two are the tryptophan and threonine.

The statistics evaluation by selected PEARSON correlation coefficients of note with the superior values for all kinds of flours and meals which have been obtained from cereals and leguminous. Superior coefficients were registered at phenilalanine, tryptophan, threonine. The other coefficients presents positive values, which means that their presence in the various types of flour and recommend we study these types of flour for optimization of human nutrition and food safety of the population. It is to be noticed that the amplitude of essential aminoacids (variation) is higher when the grain is around the interval of 98-125%.(Hill A.B.)These aspects indicate a linear correlation with lack of intensity between the series of experimental data (aminoacids contents – the content of protein FAO mg/g proteins). In this direction, the cubic function was used, $y = b_0 + b_1 x + b_2 x^2 + b_3 x^3$, which, for the field of studied definition, follows closely the studied phenomenon.

Table 1

Percentage of essential amino acids in flours taken in study

Essential aminoacids/ variaty of flours	Wheat flour	Rye flour	Corn flour	Barley flour	Buck-wheat flour	Rice flour	Soya beans flour	Lentil flour	Peas flour	The content of protein FAO mg/g protein
Valine	40,881	59,249	54,377	38,501	53,01	53,836	60,827	69,937	52,481	50
Izoleucine	45,073	37,572	54,377	33,435	44,924	52,49	52,678	51,967	63,454	40
Leucin	89,099	69,364	153,85	68,896	105,12	98,25	77,707	92,278	78,721	70
Lysine	26,205	40,462	27,851	28,369	26,954	39,031	60,827	77,222	79,198	55
Metionine	26,205	14,451	17,241	14,184	19,766	20,188	16,298	14,085	11,927	35
Threonine	28,302	31,792	21,22	30,395	36,837	34,993	40,454	48,082	44,37	40
Tryptophan	10,482	14,451	7,9576	9,1185	15,274	12,113	13,097	10,685	12,405	10
Phenilalanine	52,411	59,249	42,44	58,764	51,213	55,182	46,857	55,852	52,958	60
Essential aminoacids	30,294	32,659	37,931	28,166	35,31	36,608	36,874	42,011	39,552	39,71

Table 2

The proportion of cover of protein content FAO, %

Essential aminoacids/ variaty of flours	The content of protein FAO mg/g protein	Wheat flour	Rye flour	Corn flour	Barley flour	Buck-wheat flour	Rice flour	Soya beans flour	Lentil flour	Peas flour
Valine	50	81,761	118,5	108,75	77,001	106,02	107,67	121,65	139,87	104,96
Izoleucine	40	112,68	93,931	135,94	83,587	112,31	131,22	131,69	129,92	158,64
Leucin	70	127,28	99,092	219,78	98,422	150,17	140,36	111,01	131,83	112,46
Lysine	55	47,646	73,568	50,639	51,58	49,008	70,965	110,59	140,4	144
Metionine	35	74,873	41,288	49,261	40,527	56,475	57,681	46,566	40,241	34,079
Threonine	40	70,755	70,755	53,05	75,988	92,093	87,483	101,14	120,2	110,93
Tryptophane	10	104,82	144,51	79,576	11,854	152,74	121,13	130,97	106,85	124,05
Phenilalanine	60	87,352	98,748	70,734	97,94	85,355	91,969	78,095	93,087	88,263

Table 3

PEARSON function about the coefficients of correlation

	Wheat flour	Rye flour	Corn flour	Barley flour	Buckwhe at flour	Rice flour	Soya beans flour	Lentil flour	Peas flour
Valine	0,814	0,881	0,710	0,883	0,770	0,850	0,865	0,886	0,816
Izoleucine	0,817	0,907	0,709	0,883	0,766	0,848	0,872	0,891	0,816
Leucine	0,834	0,910	0,720	0,885	0,773	0,870	0,904	0,898	0,864
Lysin	0,839	0,864	0,822	0,824	0,758	0,918	0,855	0,843	0,806
Metyonine	0,975	0,866	0,871	0,905	0,913	0,939	0,854	0,843	0,818
Threonine	0,977	0,960	0,899	0,963	0,999	0,997	0,973	0,970	0,979
Tryptophan	0,990	0,977	0,957	0,971	0,999	1,000	0,992	0,994	0,996
Phenylalanine	1,000	1,000	1,000	1,000	1,000	1,000	1,000	1,000	1,000

Table 4

Coefficients of regressive cubic function $y = b_0 + b_1 x + b_2 x^2 + b_3 x^3$ (fractions)

	r2	Sig f	b0	b1	b2	b3
Wheat flour	1	0.011	3.30	0.25	-0.0016	$\lvert b_3 \rvert < 10^{-4}$
Rye flour	0.998	0.045	8.38	0.55	-0.0022	$\lvert b_3 \rvert < 10^{-4}$
Corn flour	0.999	0.035	3.61	0.05	-0.0002	$\lvert b_3 \rvert < 10^{-4}$
Barley flour	0.985	0.122	3.41	0.30	-0.0024	$\lvert b_3 \rvert < 10^{-4}$
Buckwheat flour	0.999	0.032	6.21	1.03	-0.065	$\lvert b_3 \rvert < 10^{-4}$
Rice flour	0.984	0.121	3.40	0.29	-0.0023	$\lvert b_3 \rvert < 10^{-4}$
Soya beans flour	0.999	0.035	3.61	0.05	-0.0002	$\lvert b_3 \rvert < 10^{-4}$
Lentil flour	0.999	0.035	3.61	0.05	-0.0002	$\lvert b_3 \rvert < 10^{-4}$
Peas flour	0.999	0.035	3.61	0.05	-0.0002	$\lvert b_3 \rvert < 10^{-4}$

CONCLUSIONS

In the present work essential amino acids are compared the weights to the needs of FAO recommended standard at the level of the human body and have been determined to be consumed edible flours, in terms of food safety, with a high content of essential amino acids, as follows:

1. Lysina, isoleucine, valine presents maximum and all soyabeans flour and average values for edible flours of lentils, peas, and minine limits for edible flours: wheat, rye, barley, buckwheat, peas and rice.

2. Phenilalanina flour have the maximum value from register, while average values are obtained from the edible flours: lentils and peas.

3. Dynamics of amino acids that can be synthetizated by body human shows us that: glutamic acid has the largest, soy flour, being followed by the peas flour and flour of buckwheat. Average values can be observed from the flour of wheat, lentils, rice flours. Asparagic acid, glycine, arginine and hystidine maximum values recorded for soyabeans flour, average values for edible flours of lentils and peas.

4. In the diagram you can see that the level of essential amino acids is lower than the level of unessential amino acids, so they have a higher weight than those essential. Thus, the most important essential amino acids for are soyabeans flour, peas and lentils that in.

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