

## **THE INFLUENCE OF PEA EXTRACT ADDITION UPON BAKERY PRODUCTS QUALITY**

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### **Abstract**

*Food supplementing with essential amino-acids can be achieved by the help of bakery products. The addition of pea protean isolated to bread is a possibility of improving the nutritive value of this product. The technological effects of the protean isolated contribution are analyzed as well as the effects upon bread nutritive value, especially by increasing the lysine and treonine content with benefic effects upon the consumers' health and children' physical and intellectual development.*

**Keywords:** *pea protein isolated, lysine, treonine, water retention capacity, freshness degree.*

### **Introduction**

Bread, a largely-used food in everyday diet, may be an important vector for food supplying with a series of biologically active substances. Bread protein fortifying can be made by addition of (3-5%) sunflower flour, depending on the flour quality, use of protein derivatives from milk industry, which besides the addition of essential amino-acids may provide bread with phosphorus and calcium, fish food flour devoid of specific odour (up to 5% as compared to wheaten flour), use of yeast derivatives due to the protein content rich in lysine and high content of B vitamins. The nutritive qualities of bread proteins can be improved by covering their deficit in lysine. It is more reasonable to appeal to covering of lysine deficit (Belitz, 2000) by use of some protein sources rich in this amino-acid than to introduce pure lysine into flour. To this sense, additions of pea proteins have spectacular effects upon the biological value of cereal proteins. Therefore, the pea flour can be utilized in bakery industry as a protein fortifier and, if it is enzymatically active can also improve the bread quality as a result of the fat-oxygenase action.

*The Influence of Pea Extract Addition upon Bakery Products Quality*

This paper focuses on the effects of pea protean isolated introduction upon bread nutritive value, as well as its bakery qualities. The pea isolated is extracted from yellow pea by a naturally manufacturing process, where extraction solvents are not used, but only acids and bases, without strong thermal treatment, high purity of protein fraction by a wetting process, and the pea sorts used have not genetically been modified. The physical-chemical and microbiological characteristics of the pea extract used (produced by Provital Industrie S.A.Belgium) are shown in table 1.

**Table 1.** The physical-chemical and microbiological characteristics of the pea extract

Physical-chemical characteristics	Physical-chemical characteristics	Microbiological characteristics
Proteins 90+/-2%	Density (after packing) 0.40kg/l	yeasts and moulds max.50/g
Dry substance 95+/-2%	Solubility (pH 7) >600g/l	coli form bacteria max.50/g
Carbohydrates max.4.5%	pH (10%solution) ~7.0	Escherichia coli absent/g
Ash, max.6%	Colour - cream	Salmonella absent/25g
Fat, max.1%	Taste - neutral	Listeria absent/g
Granulosity, <200µm	Heavy metals (Hg, Pb, Cd, As) max. 0.5 ppm	-

The amino-acid content of pea extract is shown in table 2 (Consucra, Product Sheet for Pisane HD - pea protein isolate)

**Table 2.** Content of amino-acids (g/100g protein extract)

Wistaria	4.1	Treonine	3.9	Methionine	1.2
Alanine	4.4	Tyrosine	3.9	Cysteine	1.1
Valine	5.2	Aspartic acid	12.5	Lysine	7.7
Leucine	8.7	Pentalanine	5.6	Histidine	2.7
Isoleucine	4.7	Indole amino-propionic acid	1.0	Arginine	9.1
Serine	5.6	Proline	4.4	Glutamic acid	20.3

## **Experimental**

The flour used at determining is of 650 type, white, no strange taste and mould, petrol, old or other strange odours. As a result of measurements made by using a value-meter line, it was clear that the flour was good at baking, having a power of 50-65. The analyses were carried out on three of samples.

1. a witness sample, consisting of 300 g of 650 type flour, 6 g of salt, water
2. a sample with 1 % addition of pea protein isolated, consisting of 300 g of 650 type flour, 6 g of pea isolated, 6 g of salt, water
3. a sample with 2 % addition of pea protein isolated, consisting of 300 g of 650 type flour, 6 g of pea isolated, 6 g of salt, water
4. a sample with 3% addition of pea protein isolated consisting of 300 g of 650 type flour, 9 g of pea isolated, 6 g of salt, water.

The farina-graph method (Bordei, 2004) is used to determine the dough rheological properties and the values obtained for the three types samples are shown in table 3. Each value shown in the tables is the medium of ten determinations

**Table 3.** Dough rheological properties determined by the farina-graph method

Parameters	witness sample	1% isolated sample	2% isolated sample	3% isolated sample
Forming time (min)	1.9	2.3	2.2	1.8
Stability (min)	9.3	10.9	10.7	6.8
Dipping (FU)	38	36	33	49
Hydration capacity	59.6%	61.2	62.5%	63.5%

The flour hydration capacity, determined by the help of the farina-graph, showed water retention capacity of the protein isolated, which plays an important part in maintaining bread freshness.

One can see from the value analysis of the parameter extension-gram, an increase of stretch resistance, a decrease of extensibility, and

one can appreciate from the ratio value  $\gamma = R/E$  whether the analyzed flour is of good quality.(Sîrbu 2001).

**Table 4.** The extensigram parameters

Parameters	1% isolated sample			2% isolated sample			3% isolated sample		
	45 min.	90 min	135 min	45 min	90 min	135 min	45 min.	90 min	135 min
Stretch resistance (BU)	108	203	237	118	223	255	132	244	274
Extensibility (mm)	175	162	137	170	154	137	164	143	137
Absorbed energy (cm)	41	66	61	42	65	62	45	64	66
$\gamma = R/E$	0.61	1.25	1.73	0.69	1.44	1.86	0.80	1.70	2.00

The flour bakery potential, with or without pea protein isolated, was established by the baking test. The analyzed dough samples were made of the ingredients and quantities shown in table 5.

**Table 5.** The quantities used to make dough samples

Ingredients	Smple witness	Smple 1% isolated	Sample 2% isolated	Sample 3% isolated
	Units (g)	Units (g)	Units (g)	Units (g)
650 type flour	1500	1500	1500	1500
yeast	37.5	37.5	37.5	37.5
Salt	21	21	21	21
Water	894	918	937.5	952.5
Protein isolated	-	15	30	45

After having prepared the ingredients, a kneading process follows in two speed steps. Afterwards the dough is let to rest for 10 minutes, the dough temperature is measured and each dough sample is weighed. The determined values are shown in table 6.

After the kneading process, the samples look like normal dough, without being dry or viscous. The next operation is that of dough processing, which is automatically modeled in a round shape, then it is let to ferment for 15 minutes. After the pre-fermentation period, an automatic and manual modeling followed, when all samples maintained their shape and developed normally. The fermentation

stage takes place at a temperature of 35°C and humidity of 70%, for 30 minutes. After having fermented, the witness sample maintained its shape while the protein isolated samples showed a slight tendency of subsidence. Before being put into oven, all samples are superficially notched. The baking process parameters are: 20 minute time, temperature of 240-250°C.

**Table 6.** Technological parameters for dough preparing

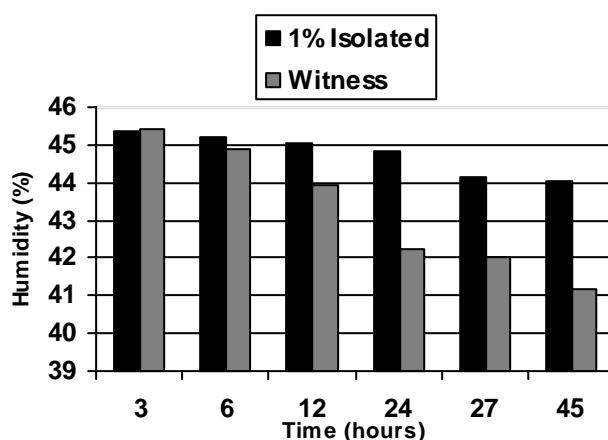
Kneading sample	witness sample	1% isolated sample	2% isolated sample	3% isolated sample
Water temperature, °C	5	5	5	5
Kneading v <sub>1</sub>	2:00	2:00	2:00	2:00
Kneading v <sub>1</sub>	8:25	8:25	8:25	8:25
Tub rest (min)	10:00	10:00	10:00	10:00
Dough temperature, °C	27.8	27.5	27.3	26.5
Dough quantity, g	2452.5	2491.5	2526	2556

## Results and Discussions

The results of organoleptic examination on samples show that both witness sample and isolated sample have the same colour and crust aspect, fine and medium pores but the volume and the height are grater.

The samples containing protein isolated retain better humidity, and freshness is kept for longer time, figure1. One can see from the determination analysis that the sample humidity decreases only by 2, 66% after 45 hours. As for the product nutritive value (Segal 2002), one can notice that it has been improved by the amino-acids addition and especially by lysine, brought by the pea protein isolated, table 7.

The protein addition determines growth, cerebral development, physical and intellectual performances, reactions to aggression, social behaviour. It is known that in foods currently used, lysine, sulphur amino-acids, indole amino-propionic acid are biological value limiting factors of some proteins. As it is shown in table 10, the 2% protein isolated addition determines significant increase in the content of essential amino-acids with percentages between 14.63-45.83 and at a 3% addition the increase is between 21.95-55.93.



**Fig.1.** Samples with protein isolated and witness humidity variation

Lysine and treonine bread fortifying has superior effect when the product is consumed by children. A series of investigations carried out on humans and animals showed that lysine-bread fortifying determines an important acceleration of increase and improvement of the nitrogen retention at children and gowns-up. At children a weight increase is noticed similar to that obtained by consumption of an equivalent casein quantity. At the same time, the subjects had a high concentration of serum proteins and normal morphology of the hepatic tissue, increased level of free amino-acids.

### **Conclusions**

The protein isolated addition to flour used at baking processing has benefic effects:

- technological effects by increasing hydration capacity bread bulk up(with 7-9% in two days), as well as the freshness degree of products;
- nutritive effects, by increasing the quantity of lysine between 14,63 and 55,93% and treonine between 13,68 and 32,23%, essential amino-acids that can be introduced into organism by bakery products, with benefic effects upon the children' health, growth and physical and intellectual development.

**Table 7**

Amino-acids (mg)	Flour (100)	1% pea protein isolated	2% pea protein isolated	3% pea protein isolated	Amino-acid addition% (1%)	Amino-acid addition% (2%)	Amino-acid addition (3%)
Isoleucine	349	47	94	141	11.86	21.21	28.77
Leucine	644	87	174	261	11.90	21.27	28.83
Lysine	182	77	154	231	29.73	45.83	55.93
Methionine	140	12	24	36	7.89	14.63	21.95
Phenylalanine	468	56	112	168	10.68	19.31	26.33
Treonine	246	39	78	117	13.68	24.07	32.23
Indole amino-propionic acid	93	10	20	30	9.70	17.69	26.54
Valine	386	52	104	156	11.87	21.22	28.78

## **References**

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