STUDY ON THE VALORIFICATION OF GERMINATED WHEAT ON A PRODUCT CALLED "APINUTRIGERM''

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Abstract: The aim of this work was to create a food with many qualities: with a very high nutritional value, very pleasant, very easy to find, by and eat and many people to like it. Ice cream is a very pleasant food and many people like it. Unfortunate is one of the most important sources of energy with very poor nutritional value. Is well known that germinated seeds are an important source for many nutrients. So we use germinated wheat, milk, hazelnuts, honey and yolk egg because their high nutritional value. We try to have an ice cream without additives because many people are concern about using them. We calculate an index called "nutritive value for 10 elements" to prove its very high nutritional value. Sensory evaluation was used to determine consumer's acceptability. In the end we find that we create a pleasant ice cream with the same energy content as others but more nutritive and without additives.

INTRODUCTION

As a result of industrial and technological developments, consumers do not have enough time to cook or provide a good nutritional balance. Therefore, consumers need convenient foods such as instant noodles, boil in the bag foods, and frozen foods. Hence, eating habits have changed and processed foods have been blamed for poor or imbalanced nutrition. Therefore APINUTRIGERM product was created for consideration in healthy foods. Germinated wheat contains more vitamins, minerals, fibers, and physiologically activated principles than ungerminated wheat (Table 1). APINUTRIGERM product were prepared using germinated wheat, milk, yolk egg, honey and hazelnuts, because their high nutritional value (Table 2). Consumers do not, however, make their decisions based on health claims only. Flavor and sensory characteristics remain important criteria in food products. Germination can be used to improve flavor and sensory characteristics of wheat. Starch is slowly hydrolyzed during germination, and germinated wheat has slightly lower carbohydrates content (1.5-2%) as ungerminated wheat. Germination of wheat also leads to an increase in the essential amino acids content (see Table 1). Even content in amino acids like

lysine and tryptophan which are limiting amino acids for cereals increase. Germination has been used to lower the phytate content of wheat. Phytate is an antinutritional factor considered to reduce bioavailability of minerals.
The addition of whole grains to food is of special interest because starch is more slowly digested from whole kernels than from milled flour, resulting in a lower insulinaemic index. Germination also offers a means of softening kernel texture, which is important if whole kernels are to be added to food.

Table 1 – Variation of nutrients in wheat content after germination (amount in 100 grams, dry matter)*

Nutrient	Units	Wheat	Germinated wheat	Variation
VITAMINS Ascorbic acid	mg	0	4,97	appear
Thiamin	mg	0,44	0,43	- 2,27
Riboflavin	mg	0,13	0,29	+ 123
Niacin	mg	6,28	5,90	- 6,05
Pantothenic acid	mg	1,09	1,81	+ 66,05
Vitamin B_6	mg	0,34	0,50	+ 47,05
Folate (total)	µg	43,7	72,72	+ 66,40
Vitamin B_{12}	µg	0	0	0
Vitamin A	IU	10,35	0	disappear
Vitamin E	mg	1,16	0	disappear
Vitamin D	IU	0	0	0
Vitamin K	µg	2,18	0	disappear
LIPIDS Total fatty acids saturated	g	0,3	0,39	+ 30
Total fatty acids monounsaturated	g	0,23	0,28	+ 21,73
Total fatty acids polyunsaturated	g	0,72	1,06	+ 47,22
Cholesterol	g	0	0	0
AMINO ACIDS Tryptophan	g	0,18	0,22	+ 22,22
Threonine	g	0,42	0,48	+ 14,28
Isoleucine	g	0,52	0,54	+ 3,81
Leucine	g	0,98	0,97	- 2,04
Lysine	g	0,38	0,46	+ 21,05
Methionine	g	0,23	0,22	- 4,34
Cystine	g	0,37	0,25	- 32,43
Phenylalanine	g	0,68	0,66	- 2,94
Tyrosine	g	0,44	0,52	+ 18,18
Valine	g	0,63	0,69	+ 9,52
Arginine	g	0,68	0,81	+ 19,11
Histidine	g	0,32	0,37	+15,62
Alanine	g	0,51	0,56	+ 9,80

Nutrient	Units	Wheat	Germinated wheat	Variation
AMINO ACIDS Aspartic acid	g	0,73	0,86	+ 17,80
Glutamic acid	g	4,60	1,66	- 63,91
Glycine	g	0,60	0,58	- 3,33
Proline	g	1,48	1,28	- 13,51
Serine	g	0,67	0,65	- 2,98

* - Values are calculate after USDA National Nutrient Database

Table 2 – APINUTRIGERM ingredient's nutrient content (amount in 100 grams of edible portion)*

Nutrient	Units	MILK	EGG YOLK	HONEY	HAZELNUTS
MINERALS Calcium	mg	119	129	6	114
Iron	mg	0,05	2,73	0,42	4,70
Magnesium	mg	13	5	2	163
Phosphorus	mg	93	390	4	290
Potassium	mg	151	109	52	680
Sodium	mg	49	48	4	0
Zinc	mg	0,38	2,30	0,22	2,45
Copper	mg	0,01	0,077	0,036	1,725
Manganese	mg	0,004	0,055	0,080	6,175
Selenium	µg	2	56	0,8	2,4
VITAMINS Ascorbic acid	mg	1,5	0	0,5	6,3
Thiamin	mg	0,038	0,176	0	0,643
Riboflavin	mg	0,161	0,528	0,038	0,113
Niacin	mg	0,084	0,024	0,121	1,80
Pantothenic acid	mg	0,313	2,990	0,068	0,918
Vitamin B_6	mg	0,042	0,350	0,024	0,563
Folate (total)	µg	5	146	2	113
Vitamin B_{12}	µg	0,36	1,95	0	0
Vitamin A	IU	138	1442	0	20
Vitamin E	mg	-	2,58	0	15,03
Vitamin D	IU	-	107,423	0	-
Vitamin K	µg	-	0,7	0	14,2
LIPIDS Total fatty acids saturated	g	2,278	9,551	0	4,464
Total fatty acids monounsaturated	g	1,057	11,738	0	45,652
Total fatty acids polyunsaturated	g	0,136	4,204	0	7,92
Cholesterol	g	14	1234	0	0
Phytosterols	g	-	-	-	96

Nutrient	Units	MILK	EGG YOLK	HONEY	HAZELNUTS
AMINO ACIDS Tryptophan	g	0,046	0,177	0,004	0,193
Threonine	g	0,148	0,687	0,004	0,497
Isoleucine	g	0,198	0,866	0,008	0,545
Leucine	g	0,321	1,399	0,010	1,063
Lysine	g	0,260	1,217	0,008	0,420
Methionine	g	0,082	0,378	0,001	0,221
Cystine	g	0,030	0,264	0,003	0,277
Phenylalanine	g	0,158	0,681	0,011	0,663
Tyrosine	g	0,158	0,678	0,008	0,362
Valine	g	0,220	0.949	0,009	0,701
Arginine	g	0,119	1,099	0,005	2,211
Histidine	g	0,089	0,416	0,001	0,432
Alanine	g	0,113	0,836	0,006	0,73
Aspartic acid	g	0,249	1,550	0,027	1,679
Glutamic acid	g	0,687	1,970	0,018	3,710
Glycine	g	0,069	0,488	0,007	0,724
Proline	g	0,318	0,646	0,090	0,561
Serine	g	0,178	1,326	0,006	0,735
Energy	kcal	64	322	304	628
Energy	J	268	13461	1272	2629
Protein	g	3,28	15,86	0,30	14,95
Fat	g	3,66	26,54	0	60,75
Carbohydrate	g	4,65	3,59	82,40	16,70
Total dietary fiber	g	-	0	0,2	9,7
Total sugars	g	-	0,56	82,12	4,34
Starch	g	-	0,07	-	0,48

* - USDA National Nutrient Database

MATERIALS AND METHODS

Germinated wheat, milk, egg yolk, honey and hazelnuts were used for preparation of APINUTRIGERM product. Our interest was to obtain a very pleasant ice cream so we try different proportion of ingredients.

The wheat used was a common type *(Triticum aestivum)* purchased from a local market. Milk, honey and eggs were from producer. Hazelnuts were also purchased from local market.

For the determination of various values such as “caloric value” (VC) and “nutritive value for 10 elements (VN)” was made calculation. Caloric value was calculated using formulas method: 10.1, Dumitru, G., et. al., 2002, pg. 262). Nutritive value for 10 elements was calculated using formulas method: 10.1, Dumitru, G., et. al., 2002, pg. 270).

Our work team proposes a processing method like that presented in Figure 1.

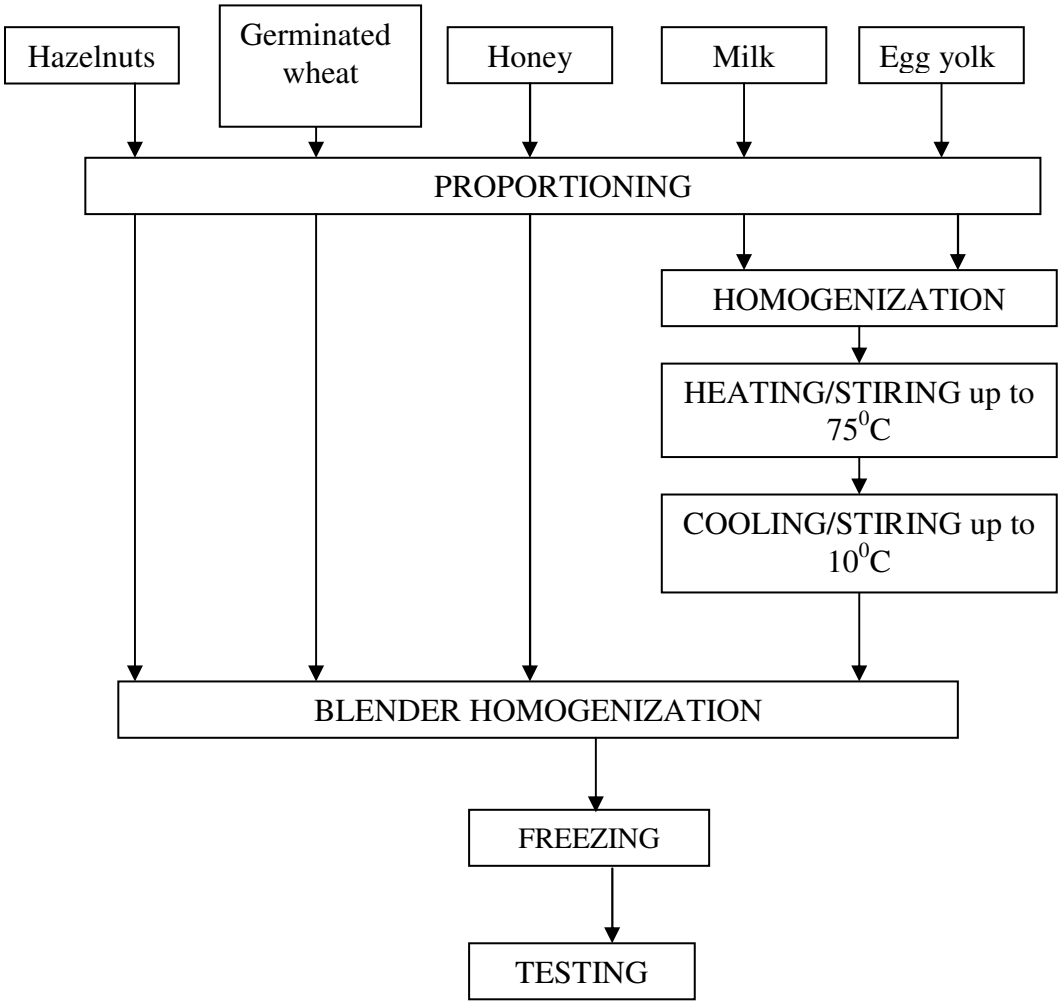

Figure 1: Processing method propose for preparation of APINUTRIGERM product

Sensory evaluation was used to determine consumer's acceptability. The two experimental ice creams were analyzed by 100 people: all ages between 18 and 60. Sensorial properties of APINUTRIGERM's product were testing on 2 samples. One with cinnamon and other with coffee flavor.

Questionnaire was:
1. Ice cream looks: bad, unsatisfactory, satisfactory, good, very good;
2. Ice-cream's color is: bad, unsatisfactory, satisfactory, good, very good;
3. Ice-cream's taste is: bad, unsatisfactory, satisfactory, good, very good;
4. Ice-cream's smell is: bad, unsatisfactory, satisfactory, good, very good;
5. Ice-cream's firmness is: bad, unsatisfactory, satisfactory, good, very good;
6. Ice-cream's creaminess is: bad, unsatisfactory, satisfactory, good, very good;
7. Your favorite flavor ice cream is: cinnamon, coffee, both;
8. What do you think about caloric and nutritional values of our product? How are them? bad, unsatisfactory, satisfactory, good, very good;
9. Eating APINUTRIGERM is like eating an ice-cream? Not at all, almost, the same.
10.What is the best thing of our product?
11. What is the worst thing of our product?
12. If you could change something about our product, what it would be?
13. Have you some suggestions?

RESULTS AND DISCUSSION

The results of questionnaire about sensory evaluation of APINUTRIGERM product are shown in Table 3:

Table 3. The results of questionnaire about sensory evaluation of APINUTRIGERM product

Sensory descriptors	**%**				
	Very good	**Good**	**Satisfactory**	**Unsatisfactory**	**Bad**
Appearance	12,98	53,24	28,57	5,21	-
Color	12,98	46,75	35,06	5,21	-
Taste	37,66	38,96	22,08	1,3	-
Smell	27,27	46,75	19,48	6,5	-
Firmness	31,16	44,16	19,48	5,2	-
Creaminess	18,18	49,35	28,57	3,9	-
VC, VN	70,13	28,57	1,3	-	-
Flavor	**CINNAMON**		**COFFEE**		**BOTH**
	51,95		38,66		9,09
Feeling like eating ice-cream	**Not at all**		**Almost**		**The same**
	7,8		71,43		20,77

The results from table 3 showed that consumers assessed the APINUTRIGERM product's sensory properties as very good. The results from this questionnaire indicate that APINUTRIGERM product can be successfully used as an ice cream.
The result corresponding to caloric value (VC) is: VC = 221,86 kcal (928,48 J). In table 4 is shown comparable values of caloric values for other ice-creams.
The result corresponding to nutritive value for 10 elements (VN) determination is: VN = 16,36. In Table 4 is shown comparable values of nutritional values for other ice-creams.

Table 4. Dates for caloric and nutritional values of other ice-creams comparatives with APINUTRIGERM's product*

Nr. Crt.	**Product's name**	**VC (kcal)**		**VN**	
1.	**APINUTRIGERM product**	**221,86**		**16,36**	
2.	Vanilla ice-cream	249	average value 222,6	10,25	average value 9,58
3.	Strawberry ice-cream	192		9,28	
4.	Coffee ice-cream	201		6,64	
5.	Caramel ice-cream	255		12,26	
6.	Chocolate ice-cream	216		9,51	

*- caloric values and nutritive value for 10 elements were calculated using the same method for all products

The differences between APINUTRIGERM product's caloric values are very small as compared to those in others ice-creams. As we can see, caloric value of APINUTRIGERM product is very close to average value of other ice-creams (see Table 4).
The results from Table 4 showed that is significant differences in nutritional value of 10 elements for APINUTRIGERM product comparative with same index of others ice-creams. Nutritional value of 10 elements for APINUTRIGERM product is bigger than any other evaluated ice cream (see table 4). Nutritive value of 10 elements for APINUTRIGERM product increase from 9,58 (average value for same index of other ice-creams) to 16,36. It means an increase with more than 77%.

CONCLUSIONS

APINUTRIGERM is considered to be a more promising food for consumers in terms of nutrition and convenience. Actually processed foods containing germinated wheat are not sold in Romania. Imbalanced nutrition and bad eating habits may cause quite serious health problems and a pleasant ice cream like APINUTRIGERM containing various functional materials may have benefits for health.
Compared with others ice creams, this one made with germinated wheat have the same caloric value but more high nutrient value than others.

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