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Usage of Composite Flour in Pastry Products

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Abstract: The materials presented in the study are aimed to solve the problems of increased nutritional value of confectionery products through the use of composite flour. The results of research allows to determine the aminoacid, minerals and vitamin composition of the flour, nutritional value of ginger bread using composite flour.

Key words: Composite flour, flour composition, nutritional value of ginger bread, aminoacid, minerals

INTRODUCTION

The nutritional status of the population one of the important factors which determine the health and the preservation of the gene pool of the nation. Massive population surveys which are regularly conducted in many countries show significant deviations in the diet of almost all groups of people, regardless of lifestyle habits or income level.

One of the best ways to solve this problem is to enrich the food supply with protein, vitamins, macro and micronutrients, dietary fibers, using unconventional materials. This method has proved to be positive in a number of countries for many years and based on an analysis of the experience, recognized as the most effective (Fox and Mulvihill, 2007).

Thus, the fortification of wheat flour and I grades, the development of new types of fortified flour to solve this problem is very important.

One of the effective ways to improve the nutritional and biological value of Confectionery Products (hereinafter CP) is the development of technologies with adding flour from cereals such as oats, soybeans, barley, maize, rice, sorghum, amaranth, panic and others crops (Fox and Mulvihill, 2007; Hui and Corke, 2008).

MATERIALS AND METHODS

Research was conducted at the laboratories of the Department of "Biotechnology and Foodsafety" and Kazakhs-Japan innovation center KazNAU. In all the samples of corn, soybean, oat and wheat flour and finished goods were analyzed for chemical composition, amino acid composition? Franctional composition of proteins and nutritional value of flour from different cereals and flour composite composition.

In research, the composite flour was made by mixing wheat flour with the flour from different crops: sample no. 1 contains oat and wheat flour in ratio 10:90; sample no. 2 contains soybean and wheat flour in ration 10:90; sample no. 3 contains corn and wheat flour in ration 10:90; sample no. 4 contains soy, oat, corn and wheat flour in ratio 10:10:10:70.

To research the influence of flour of composite composition to the proteins, vitamins and minerals were conducted laboratory baking flour confectionery products according to the method and formulation (Puchkova, 2004). After 14 h of baking, the content of proteins, minerals and vitamins were determined.

The protein content of the flour and Confectionery Products (CP) was determined by Kjeldal Method on the automatic Kjeltec Auto analyzer of Tecator firm (Sweden) according to SSS (State Standard Specification) 10846-93, fractional composition of proteins by Osborne. The content of macro and micro elements and vitamins were determined by Yu (2013).

RESULTS AND DISCUSSION

Table 1 shows the comparative analysis of the physico-chemical flour of various species of cereals (Puchkova, 2004).

According to the information given in Table 1, soybean, corn and oat flour by production value are higher than wheat flour. Fat and protein content in soy

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Table 1: Chemical composition oat, soybean, corn and wheat flour (100 g^{-1})

Name of the components	Name of the flour			
	Oat	Soybean	Corn	Wheat
Humidity (%)	14.0	9.0	12.0	14.0
Proteins (g)	11.1	38.5-45.6	7.2	10.0
Fat (g)	1.3	6.3-20.0	1.5	1.3
Mono and disaccharides (g)	3.1	10.3	2.8	1.7
Starch (g)	60.0	16.0-21.5	72.0	67.1
Fiber (g)	1.3	2.6-2.9	0.6	0.2
Minerals (g)	1.0	4.7-4.9	1.5	0.7
Energy value (cal.)	300.3	328.2-429.5	305.5	328.6

Table 2: Content of vitamins and minerals in the oat, soybean, corn and wheat flour

Name of the components	Name of the flour			
	Oat	Soybean	Corn	Wheat
Macro and micro elements (mg/100 g)				
Potassium	205.0	1600.0	340.0	176.1
Calcium	94.5	267.0	71.5	24.0
Magesium	50.0	200.0	104.0	16.3
Sodium	15.0	5.0	27.0	3.6
Iron	9.2	12.4	3.7	2.1
Sulfur	81.0	-	-	78.4
Phosphorus	343.0	600.0	301.0	86.4
Iodine	22.3	13.7	5.2	3.0
Vitamins (mg/100 g)				
β-carotene				
B_1-thiamine	0.3	1.2	0.4	0.3
B_2-riboflavin	0.08	0.3	0.1	0.1
E-tocopherol	1.86	1.28	0.62	2.5
C-ascorbic acid	0	0	0	0
PP-niacin	1.09	2.35	1.85	2.2

and oatis 4.5 and 11 times more, respectively, carbohydrates in corn flour is 8% more, fiber in oat, soybean and corn flour is 6, 5; 13, 0 and 3 times more than in wheat flour.

No less important indicator in addition to the content of proteins, carbohydrates and fiber is the content and quantity of minerals soy, oat, corn and wheat flour which perform the function of the plastic in the processes of human life (Nechayev, 2003).

The analysis of the mineral composition of flour from a variety of crops showed that the potassium oat, soybean, corn flour exceeds 1.2, 9.0, 1.9 fold, respectively, compared with the wheat flour. Potassium is an intracellular component that regulates the acid-base balance of the blood. It increases in the transmission of nerve impulses, activates several enzymes. Daily adult requirement in potassium -2500 to 5000 mg.

The calcium content in oat, soybean, corn flour is 4.0, 11.0, 2.9 times higher in comparison with the wheat flour.

The magnesium content in the oat, soybean, corn flour is 3.0, 12.5, 6.5, times, respectively more than in wheat.

Studies have determined that the iodine content in the oat, soybean and corn flour is 21.6, 17.3, 18.2 more, respectively than in wheat flour (Table 2).

Table 3: Fractions of flour proteins in percentage

Flour name	Protein content (%)			
	Total protein	Albumin+ Globulin	Gliadin	Glutenin
Wheat	14.1	17.0	22.0	33.3
Corn	6.6	31.8	6.1	17.2
Soybean	36.6	77.0	-	11.4
Oat	13.5	61.2	5.4	18.2

For a more detailed study of proteins as well as the amount of total proteins, carried out research on their fractional composition. Protein fractions were examined by Osborne to study the biological (or food) value of oat protein, soy and corn flour. Fractional composition of the protein consists of a water-soluble (albumins and globulins), alcohol-soluble (gliadin) and alkaline soluble (glutenin) proteins.

Biological (food) value of protein characterized by the presence of essential amino acids. For all albumins and globulins important characteristic of a high content of essential amino acids including lysine, threonine, methionine, isoleucine and tryptophan. Corn albumin rich isoleucine, tryptophan which are essential amino acids. Essential amino acids: lysine, isoleucine and trenin albumin contained in oats, soybeans and corn.

This study provides information about the total proteincontent and their fractions in wheat, soybean, oat and corn flour (Table 3). As a control sample, the wheat flour was used.

A content analysis of protein fractions shows that soy protein, oat and corn flour are characterized by high biological (food) value as evidenced by a significant content of albumin and globulin fractions.

The content of water-soluble proteins albumin and globulin in corn flour -31.8% of total weight which is 1.8 times more than in control sample. Number of gluten forming proteins gliadin and glutenin in corn flour is 3.6 and 1.9 time less than in sample.

The total amount of albumin and globulin in soybean flour is 4.5 times more as compared with the control. Glutenin content in the soy flour <3 times compared to the wheat flour and gliadin are not detected.

In oat meal total protein nearly the same as in wheat flour but a different protein fraction composition. The content of albumin and globulin 3.6 times more. Number of glutenins and gliadins, respectively, 4.0 and 1.8 times less than in the control.

Studies have shown in the case of composite flour composition of a mixture of soy, oat, corn and wheat flour Ist grade gluten content, the ability to resist deformation load and elongation of the line compared to the control sample yield of 10-49.7; 4-38 and 20-40%, respectively.

Table 4: Protein content in composite flour

Sample number of composite flour	Protein content (%)
0-control	14.1
1-sample	22.9
2-sample	14.7
3-sample	11.8
4-sample	15.9

Table 5: Aminoacid content of confectionery products, baked from composite flour

	Content of aminoacid (mg/100 g)	
Name of amino acid	Sample 4	Control
Essential amino acid	3335	2376
Isoleucine	520	382
Valine	569	367
Leucine	637	585
Lysine	408	194
Methionine	161	115
Threonine	358	230
Tryptonine	128	87
Phenylalanine	554	416
Nonessential amino acids	6979	5123
Alanine	459	258
Arginine	592	360
Aspartic acid	729	297
Histidine	256	156
Glycine	410	276
Glutamic acid	2573	2308
Proline	870	752
Serine	540	327
Tyrosine	332	217
Cystine	218	172
Sum of amino acids	10314	7499

Significant changes in the number and quality of gluten dough prepared on the basis of composite flour from oats, soybeans, corn and wheat, caused by biochemical changes in the composition of the composite flour, indicators of the state fraction gluten forming (glutenin and gliadin) proteins.

In order to investigate the changes in biochemical properties of the composite flour protein content was determined (Table 3) and the fractional composition of proteins (Table 4).

Found that the highest protein content of the flour Sample 1 at 62.4 and 12.7% higher than the control. In Sample 2, the total protein content exceeds 4.5% of the control and only a 3 sample gives a total protein content of 16% control.

Table 5 presents a comparative analysis of the samples prepared of bakery and confectionery products flour-based composite structure with of bakery and confectionery products from wheat flour as well as indicators of nutritional value as a percentage which indicate covering the daily requirement to normal balanced diet (Asian Development Bank, 2010) (Table 6).

The protein content of Sample 4 has increased by 12.7%. The amount of vitamins and minerals has

Table 6: Nutritional value of confectionery products, baked from flour of composite content (100 g^{-1})

Name of indicators	Sample 4	Requirement per day in (%) of normal	Control	Requirement per day in (%) of normal
Nutritional value (100 g^{-1})				
Protein	9.5600	11.9	7.60	9.5
Fat	4.4300	5.5	0.90	1.1
Total carbohydrates	42.020	10.5	46.90	11.7
Vitamin E (mg, %)	3.6800	-	1.96	-
Vitamin B_1	0.3400	22.6	0.11	7.3
Vitamin B_2	0.0820	4.1	0.05	2.5
Vitamin PP (mg, %)	1.6500	11.0	1.54	10.2
B-Carotene (mg, %)	0.0020	-	cл	-
Iron (mg kg^{-1})	27.700	19.7	16.10	11.0
Iodine (mcg kg^{-1})	48.100	4.0	-	-
Energy value (kcal)	246.00	-	226.00	-

increased: E-1.8; V1-2.1; V2-1.6; PP-1.7; Fe-1.7 times compared to the control. Comparative analysis of the amino acid composition of the samples of bakery and confectionery products (Table 5) are prepared from the composite composition (Sample 4). Established, the total number of amino acid composition of proteins characterized by a 4 sample large amount of essential amino acids, respectively by 40% more than in the sample prepared from wheat flour.

Findings: The use of composite flour composition of soy, oat, corn meal, compared with wheat flour I grade, enhances energy and nutritional value of gingerbread.

CONCLUSION

The findings suggest that elevated protein, vitamin and mineral values MI using composite flour composition. As a result of comprehensive research proved the possibility of using a composite mixture of soy flour, oats, corn and wheat four I grade for the production of flour confectionery products with enhanced nutritional value.

The estimation of proteins of soybean, oats, corn and wheat flour on the account of their qualitative and quantitative fractional content and determined that a sample 1, 4 and 2 the content of proteins is 62.4, 12.7 and 4.5%, respectively more than in control and only sample 3 content of proteins is less for 15% comparing to control. It was found that the fractional composition of proteins, soybean, oats, corn and the samples from 1-4 dominates fraction albumin and globulins.

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