Bulgarian Journal of Agricultural Science, 19 (No 1) 2013, 28-31
Agricultural Academy

THE USE OF COMPOSITE MIXTURES IN THE PRODUCTION OF BISCUITS

A. K. IZEMBAEVA, B. Zh. MULDABEKOVA, A. I. IZTAEV and S. T. ZHIENBAEVA
Almaty Technological University, Republic of Kazakhstan

Abstract

IZEMBAEVA, A. K., B. Zh. MULDABEKOVA, A. I.IZTAEV and S. T. ZHIENBAEVA, 2013. The use of composite mixtures in the production of biscuits. *Bulg. J. Agric. Sci.,* 19: 28-31

At present, the combination of increasing trends of biological value of food makes us look for the confectionery industry and new unconventional sources of plant raw materials. One of the promising directions for the production of confectionery products is the use of composite mixtures in the production of biscuits.

The article considers the scientific basis of the composite effects of the mixtures on the organoleptic and physico-chemical characteristics, nutritional value biscuits, defining many important parts of consumer properties of food.

Key words: the first grade wheat flour, oatmeal, chickpeas flour, Jerusalem artichoke powder, composite mixture, sugar cookies

Introduction

Flour confectionery products - products are in high demand among all age groups and populations. Cookies are the most widely used among the products of given groups. The numbers and diversities of this group in the collection of recipes (Kaprelyants and Kiselev, 1999) confirm this. Therefore, improving the quality, nutritional value, expanding the range of confectionery as general purpose and health care becomes very important.

However, the main lack of products is that their over consumption violates balanced diets for nutrients and energy value (Nechaev, 2004).

To solve above-mentioned problems of pastry products with composite mixtures of traditional local plant raw materials enrich the biological value of final product in the manufacture. As a composite mixtures for biscuits were chosen following components of the first grade wheat flour, oatmeal and chickpeas flour, Jerusalem artichoke powder. Composite mixture has a higher nutritional value than wheat baking flour. It is characterized by relatively high in protein, full of amino acids, including essential, the presence of inulin sugars, pentosans, fats, minerals, dietary fiber, vitamins, organic acids in the form of natural compounds in that form which is better absorbed by the human body (Koryachkina, 2006).

It is known that the lack of protein in the diet affects the health of the human body and can cause various diseases. Proteins do not only play an important role in the body but also in the technological process to prepare the dough, in the formation of flavoring and aromatic substances, baking cookies, determine many important consumer properties of food products.

Oatmeal, chickpeas flour and Jerusalem artichokes are good sources of protein and lipids; they contain amino acids that are more essential and other nutrients than wheat flour. The structure consists of oat beta-glucan - a soluble dietary fiber (soluble fiber). As proven in clinical studies, soluble fiber helps to decrease cholesterol and increase the level of blood sugar. High fiber content makes oatmeal indispensable for the prevention of

E-mail: sauleturgan@mail.ru

cardiovascular disease, diabetes and overweight (Pashchenko, Pashchenko, Koval and Uschapovsky, 2007).

Chickpeas flour takes the first place among all the legumes with the content of selenium, which enhances the body's resistance to cancer. In chickpeas flour, oil 3.7 times more than in wheat. Due to the presence of fat acids (the most important of them - linoleic and oleic) decreases the level of cholesterol, the risk of blood clots, cardiovascular disease and atherosclerosis (Anikeeva and Antipova, 2006).

Jerusalem artichoke powder has complete set of amino acids, including essential, the presence of inulin, dietary fiber, minerals, vitamins (B_1, B_2, B_3, B_5, B_6, B_7, C, PP, carotene, choline), organic acids (citric, malic, fumaric acid, succinic acid, quinine) make artichoke valuable raw material for the production of food products for preventive health and particularly useful for children, vegetarians and for elder people (Norgachevaet al., 2002).

The main purpose of research – to develop the formulations of composite mixtures of products from the first grade wheat flour, consisting of the following kinds of raw materials: wheat, oatmeal, chickpeas flour and Jerusalem artichoke powder.

Materials and Methods

In this article, it was defined the chemical composition of the components of sugar cookies: the first grade wheat flour, chickpeas and oatmeal, Jerusalem artichoke powder and food and energy value of sugar cookies.

The method for determination of moisture content (GOST 5900-90, 1990), protein (GOST 23327-98, 1998), fat (GOST 5899.90), ash content (GOST 27494-87, 1987), mineral substances of sugar cookie were defined: calcium and magnesium (GOST 51429-2006, 2006), iron (GOST 26928-86, 1986).

Results

To assess the effect of composite mixtures to the quality of products were carried out the laboratory test baking. To prepare the dough for the base as a control was selected sugar cookie recipe (g): the first grade wheat flour -100, starch-7-33, powdered sugar, molasses - 4.5, margarine - 25, salt – 0.75, soda - 0.7, ammonium carbonate 0.3 (Pavlov, 1998).

To the experimental models were added a composite mixture for: the first grade wheat flour - from 40 - 90%, oatmeal – 5 - 30%, chickpeas flour – 5 - 30%, Jerusalem artichoke powder -1 - 10%. Emulsions for biscuits prepared by mixing the components in sequence: water with dissolved salt, powdered sugar, molasses, softened margarine. Components intensely stirred with a mixer at speed 180 r /min. Then added the chemical substances and again was whisked with a mixer. Starch and composite mixtures were dosed at the end of process. Obtained dough was rolled out into the formation; molded dough baked 4-6 minutes at a temperature of 250-260°C (Lurie, 1992).

Based on conducted research from the experimental samples were determined, the optimal ratio of the composite mixtures. The best quality products observed in making composite mixtures of wheat, chickpeas flour, oatmeal, Jerusalem artichoke powder,%: 45:25:25:5. As shown the experimental data obtained by adding Jerusalem artichoke powder in products increases the amount of oatmeal and chickpeas flour at 5%.

When baking experimental laboratory test showed that the products with the addition of the mixtures had the following organoleptic characteristics: appearance, given shape and surface characterizes for the sugar cookies, a nice broken form, porous and friable structure. Water-absorbing ability samples of cookies were 188-196%, which is 7.9% higher than the control.

It is necessary to solve the following specific tasks: to analyze the nutritional value of raw materials, to make composite mixtures from above mentioned components, to assess the impact of the proposed composite mixtures to the quality of final products. Initially studied the chemical composition of raw materials (Tables 1 and 2):

The data in Table 1 shows that, in compare with the first grade wheat flour has the highest content of protein in chickpeas flour 1.9 times and in oatmeal 1.2 times.

It is known that minerals act as an important catalyst in the flow of a number of biochemical processes and function with enzymes and vitamins, affecting the course and orientation of the exchange processes (Kretovich, 1980). Information about the complex minerals

provide an opportunity to assess biologically investigated materials. Taking this into an account, was studied the mineral composition of chickpeas flour, oatmeal, Jerusalem artichoke powder and the first grade wheat flour (Table 2).

As can be seen from Table 2 that we have studied varieties of flour from cereals and legumes are rich in mineral substances. Thus, the calcium contents in chickpeas flour by 3.8 times, in oatmeal - 1.5 times, Jerusalem artichoke powder - 1.8 times higher than in the first grade wheat flour. Magnesium more respectively in 4.0, 4.2 and 1.1 times, iron more - 5.1, 2.5, 4.8 times as compared to wheat flour.

Nutritional and energy value of sugar cookies are given in Table 3.

The data in Table 3 shows that when making composite mixtures of protein increased on average 1.4 times, 1.3 fat, and minerals: calcium - 1.3 times, magnesium - 1.9 times compared to the control , with fewer carbohydrates - by 1.0 times.

Discussion

Enrichment of flour products with natural products has an advantage before chemical substances. The composition of natural products in addition to protein substances include vitamins, minerals, and other valuable food components, and they are in a natural balance in the form of natural compounds in the form which is better absorbed by the human body.

Table 1
The chemical composition of non-conventional raw materials, g

Name of raw materials	Moisture	Proteins	Fat	Carbohydrates	Ash content
First grade wheat flour	13.8	10.7	1.4	68.9	0.8
Chickpeas flour	12.6	19.9	6.5	49.7	3.1
Oatmeal	13	12.6	4.9	36.5	1.9
Jerusalem artichoke powder	7.28	9.93	1.66	74.22	6.91

Table 2
The mineral composition and vitamin contents of non-traditional materials, mg

Name of raw materials	Minerals, mg			Vitamins, mg				
	Ca	Mg	Fe	B_1	B_2	PP	E	β-carotene
First grade wheat flour	44	27.2	2.1	0.25	0.08	2.12	3.5	0.001
Chickpeas flour	166	108	10.7	0.2	0.22	2.29	0.97	0.09
Oatmeal	64.5	114	5.33	0.49	0.11	1.09	2.86	0.025
Jerusalem artichoke powder	78.8	30.6	10.1	0.07	0.06	1.3	0.02	0.01

Table 3
Food and energy value of sugar cookies

Name of indicators		The chemical composition of products	
		From the first grade wheat flour	With a composite mixture
Protein, g		8.93	12.82
Fat, g		12.26	16.43
Carbohydrates, g		70.06	65.7
Moisture, g		7.89	6.75
Ash content, g		0.86	1.2
Minerals, mg	Ca	69±13.8	87.0±17.4
	Mg	21±4.2	39.0±7.5
	Fe	2.0±0.4	2.79±0.55

In the production of biscuits, using a composite mixture reduces the amount of gluten flour and improves the structural and mechanical properties of dough and the quality of final products. Thus, the partial replacement of wheat flour results in a decrease of the elastic properties of the dough and increase in ductility by reducing the amount of gluten.

Quality of final products was analyzed after 12 hours of baking by the following quality indicators: specific volume, water-absorbing ability, toughness, humidity, and organoleptic estimation. When added a composite mixtures increased the specific volume, water-absorbing ability, friability, the toughness of products were reduced.

One of the most important indicators of the quality of products from the dough is the taste and aroma (Zubchenko, 1999). The aroma of the products may affect to the substances that have the properties of volatiles, thus making the composite mixture allows more intensive accumulation of flavoring substances in the preparation of dough and an increase in the dough and in the final products of aldehydes, higher alcohols, esters, which helps to obtain products with more expressed taste and aroma.

Conclusion

The results indicate the usefulness of floury composite mixtures in the production of confectionery. Thanks to contained in composite mixtures, protein, vitamins, minerals and other nutrients by obtained products can be recommended for preventive nutrition, which will allow expanding the range of functionality of confectionery products.

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Received September, 7, 2012; accepted for printing January, 14, 2013.