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FORMULATION AND QUALITY OF FLOURY CONFECTIONERYPRODUCTS USING VEGETABLE EXTRACTS

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ABSTRACT
Rheological equations of states of shortbread confectionery indices have been established. Principle differentin logarithmic coordinates have characteristic multidirectional curvature of sections depending on growth of shear rate.
KEYWORDS: *Confectionery products, shortbread dough, vegetable extracts, formulation, quality, rheological properties, rate of shear stress, strength properties*

INTRODUCTION

It is shown that with increase of sugar content in the product formulation there is decrease of numerical values of shear stress limit and consistency coefficient with increase of dough samples flow index on wheat flour. It was revealed that the increase for sugar in the dough leads to decrease in the degree of swelling of flour colloids and increase in the content of free water in the dough in the form of sugar solution, which causes liquefaction of the dough.

MATERIALS AND METHODS

The most common types of flour confectionary products include shortbread dough products, the unit weight of the formulations of which is 17% [1-3].

The number of formulations of semi-finished products, on which the whole variety of assortment of products from shortbread dough is based, according to the current regulatory and technical documentation is limited, and can satisfy only consumers with conservative tastes, without

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taking into account physiological characteristics, national traditions of the population, as well as regional production conditions. In order to improve the assortment and develop new formulations of flour confectionery products from shortbread dough, published materials [4-5] were studied, the results of which are presented in Table 1, reflecting the most characteristic trends in improving the assortment of shortbread semi-products produced at food industry and catering enterprises. From Table 1, a number of factors that contribute to the expansion of the range of shortbread dough confectionery products can be identified.

Table 1
Assortment of existing shortbreadsemi-products

Name of semi-products	Essential indication of the formulation	Achieved effect
Shortbread (main)	Ingredients of formulation: premium wheat flour, sugar, butter, melange, baking powder, salt, essence.	Porous friable crumb of light brown color.
Shortbread with seeded wheat flour	Allowed replacing parts of wheat flour with seeded flour.	Using non-traditional raw materials, reducing the amount of sugar, increasing the nutritional value.
Shortbread	Use of stabilized water-fat emulsions based on vegetable oil.	Intensification of the technological process, increasing the nutritional value of the semi-finished product.
Shortbread	The use of a fat composition from cotton oil-and-fat mixture, cottonseed oil, T-2 emulsifier	Improving the plasticity and quality of products, enrichment with unsaturated fatty acids

Analysis of Table 1 shows that the most intensive studies on the improvement of the shortbread semi-product formulation have been carried out in the last two decades, thanks to deeper studies of the processes of preparing semi-products, including heat treatment, as well as research and accounting for the physical-chemical properties of individual formulation components and their interaction mechanisms.

In view of the above, improving the formulation and quality of flour confectionery products using vegetable extracts is of both scientific and practical interest. In this direction, a special role belongs to the use of vegetable extracts obtained from the plants “Unabi” (ziziphus) and “Carolina” (kaspiyskaya) [6-7].

The aim of the work is to study the formulation and quality indicators of flour confectionery products using vegetableextracts obtained from the ground part of the plants “Unabi” and “Carolina” [5-7].

As objects of research, vegetable extracts obtained by extraction of the ground part of the plants “Unabi” and “Carolina”, as well as some assortments of flour confectionery productswere used. We chose shortbread cakes based on wheat flour with additives as flour confectionery products [8].

The raw materials used were in accordance with the applicable standards:

- Wheat flour (GOST 52189-2003).

When studying the chemical composition of raw materials of vegetable extracts, the content of the mass fraction of moisture, protein, fat, fiber and minerals was determined.

To assess the effect of vegetable extracts on the performance of flour confectionery products, modern methods of physical-chemical analysis were used [9-11].

Organoleptic indicators of finished products (appearance, taste, smell) were determined in accordance with GOST 27669-88.

The moisture content of the products was determined in accordance with GOST 21094-75.

Rheological parameters were determined by the methods described in the guidelines [9].

The study of the viscosity properties of the dough for biscuits - wheat (control) flour was carried out by the method of capillary viscometry, which allows evaluating the viscosity properties from the dependences of the shear stress θ on the shear rate γ, as well as flow curves depicted in logarithmic coordinates $\lg\theta = \lg\theta(\lg\gamma)$[12]

Experimental curves of the flow of dough samples on wheat flour for semi- products of wheat biscuits (sugar - 65, 75, 85 and 100% of the

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formulation content) were described by the rheological equation of state. Experimental flow curves of wheat dough samples (control), as well as dough with vegetable extracts in the amount of 5, 10 and 15% of the flour mass for samples with 75% sugar on wheat flour for wheat cakes with vegetable extracts were described by the rheological equation of state.

$$\theta = \frac{\theta_{0a}^2}{\theta} + K\gamma^n \quad (1)$$

$$\theta = \frac{\theta_{0\beta}^2}{\theta} + K\gamma^n (2)$$

где $(\theta_{0_a}^2) \equiv (\pm\theta_0)$ и $(\theta_{0\beta}) \equiv (\pm\theta_0)$

Rheological equations of state are fundamentally different, and in logarithmic coordinates have a characteristic multidirectional curvature of the sections depending on the increase in the shear rate.

The graphs of the flow curves of the rheological equation of state in the region of low shear rates are convex to the axis of shear stresses, but with increase in the shear rate, the direction of the convexity of their graphs turns to the axis of the shear rate. This can be explained by the superiority of elastic properties over plastic ones at the beginning of the flow curve, which changes to the opposite with increasing values of the shear rate. In addition, the flow curve of the rheological equation of state has a curvature opposite to the curvature of the graph of the equation and characterizes the change in the plastic-viscous flow of the object of study at low shear rates to elastic-viscous in the region of large values of the shear rate.

Figure 1 shows the flow curves of wheat dough (control) and dough on wheat flour (sugar - 65, 75, 85 and 100% of the formulation content)

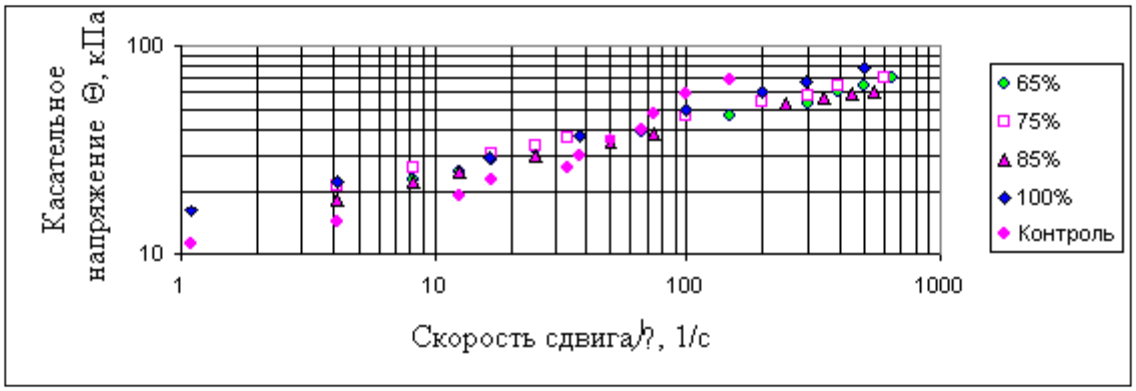

Figure 1. Curves of the flow of wheat dough (control) and dough on wheat flour for semi-finished wheat biscuit (sugar - 65, 75, 85 and 100% of formulation content).

Parameters of the rheological equations of state, which by were described the flow curves of the dough samples for semi-finished biscuits, were determined using the graphical analytical method.

Figure 2 shows the calculated parameters of the limiting shear stress θ_0, consistency coefficient K and flow index n in the form of graphical dependences on the amount of sugar content in the formulation of dough samples.

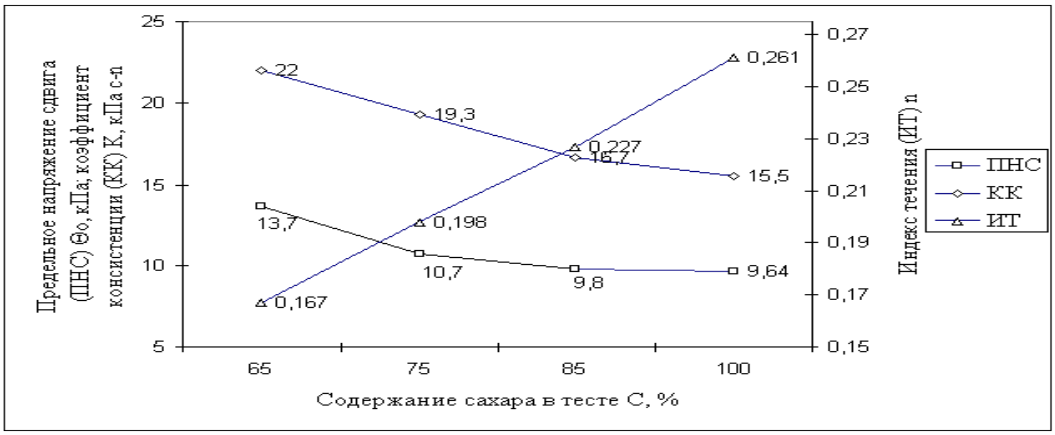

Figure 2. Dependence of parameters of rheological equation of state of dough on wheat flour for wheat biscuit on sugar content

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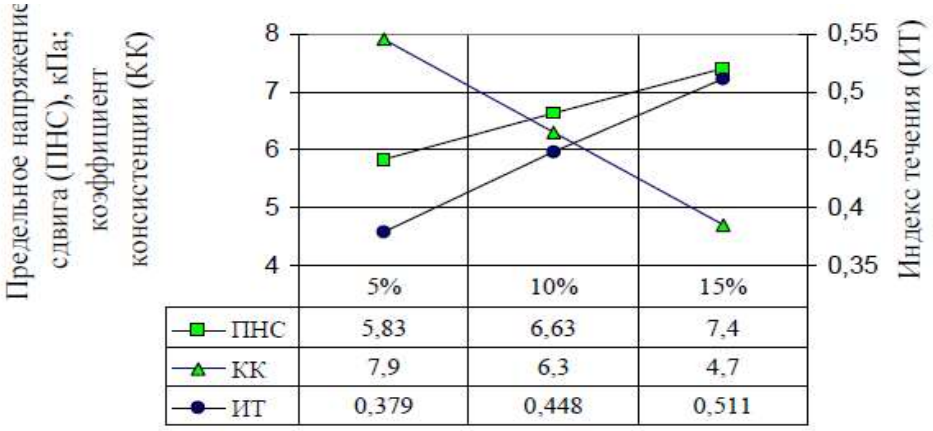
Figure 2 shows that as the sugar content increases, the numerical values of the limit shear stress θ_0 and consistency coefficient K decrease as the flow index of n dough samples on wheat flour increases. This, using the capillary viscosimetry method, confirms the participation of sugars in reducing elastically viscous and forming ductile properties of shortbread dough, since sugar has dehydrogenating properties.

An increase of amount of sugar in the dough leads to decrease in the degree of swelling of the flour colloids and increase in the content of free water in the dough in the form of a sugar solution, which causes dilution of the dough.

Figure 3 shows the effect of 5, 10% and 15% vegetable extracts on the rheological equation of the 75% sugar dough prepared on wheat flour for wheat biscuits with extracts.



Extract cocntent C, %

Figure 3. Influence of the content of vegetable extracts on the parameters of the rheological equation of state of the dough with 75% sugar on wheat flour for wheat biscuits with extracts

It can be seen from Figure 3 that with an increase in the content of vegetable extracts in the dough from 5 to 15% entered as food additives, the value of the shear stress limit θ_0 increases, and the consistency coefficient K decreases. This explains the more intense drop in effective dough viscosity (10% on average) at the increasing shear rate gradient of the prototypes compared to dough samples without vegetable extracts. Such an intensive change in effective viscosity is associated with relaxation of the dough structure due to a decrease of amount of gluten flour when replaced with vegetable extracts. Increase in the flow index of n dough samples on wheat flour with vegetable extracts also indicates decrease in its viscous properties. In addition, the flow curves of the extract dough samples have a curvature opposite to that of the sugar wheat dough flow curves (Figure 1).

In Figure 3, the shear stress limit is represented in absolute value. Table 2 gives the coordinates of the points of the flow curve plots, the transition through which, depending on the change in shear rate, requires a change of sign before the shear stress limit.

Table 2
Coordinates of inflection points of dough flow curves with 75% sugar on wheat flour for wheat biscuits

Parameter name	Content of wheat biscuits C,%		
	5	10	15
Shear rate g, s^{-1}	65	90	115
Shear stress Q, кПа	36	48	60

The amount of sugar added to the recipes for shortbread semi-products and products ranges from 18 to 30% of their output. Along with the fact that sugar is involved in the formation of the taste of products, it is of great technological importance in the preparation, in particular, of a shortbread semi-product.

Another recipe component of shortbread dough that plasticizes its structure is fat. In the production of shortbread pastry products, margarine is used (from 12 to 30% of the product weight).

Adsorbed on the surface of micelles of dough colloids, fat forms films that prevent water from penetrating into the micelles, because of which

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its content in the free-state increases, the bond between micelles is weakened, the elasticity of gluten decreases and the plasticity of the dough increases.

The greatest decrease in the strength characteristics of the structure of the shortbread dough is observed with the combined action of sugar and fat, regardless of the method and duration of kneading. As a result of the inclusion of sugar and fat in the composition of the shortbread dough which reduce the swelling of flour colloids, conditions for obtaining a dough with low moisture content and sufficient cohesionare created, due to the presence of a certain amount of water in a free state, which contributes to the adhesion of weakly swollen gluten protein threads with grains of moistened starch.

The quality of shortbread dough and products depends not only on the amount of added fat, but also on its physical condition. Fats must be plastic, since in this state they form the thinnest films that envelop the particles of swollen colloids and more easily retain air, which contributes to the porosity of products.

By changing the content of sugar and fat in the recipe of a shortbread semi-product, it is possible to regulate the physical properties of the dough and the quality of finished products.

Research on the effect of replacing sugar and fat with vegetable extract, which was entered into shortbread dough in amounts of 10, 15, 20, 25 and 30% of the flour mass has been carried out.

Figure 4 shows a graph of the dependences of the parameters of the rheological equation of Herschel–Bulckley [13-15] for all samples of shortbread dough.

As a result of mathematical processing of the dependences of the limiting shear stress θ_0, the consistency coefficient K and the flow index n on the content of vegetable extract C, hyperbolic functions were obtained, which describe following dependences:

$$\theta_0 = A_1 \times C^{B1}; = A_2 \times C^{B2} \quad (3)$$

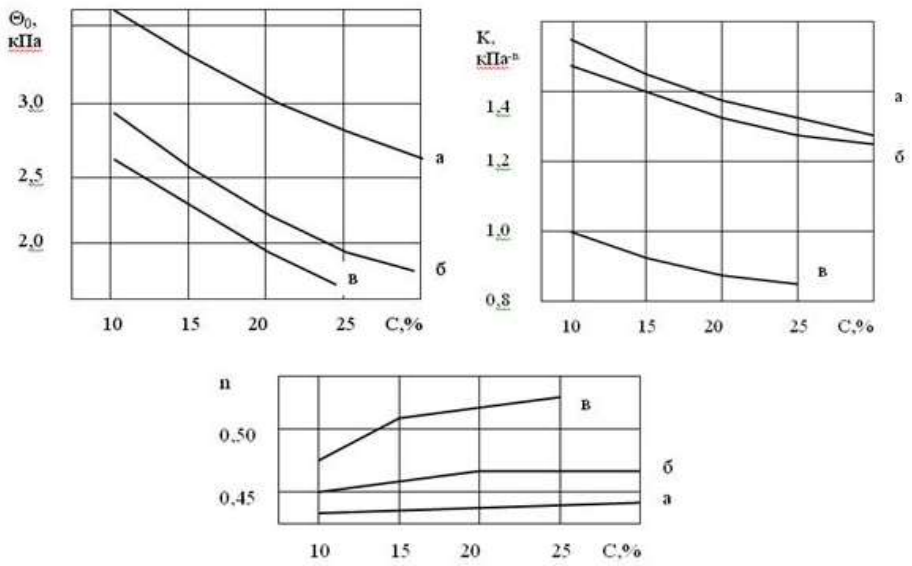

Figure 4. Dependence of the limiting shear stress Q_0, the consistency coefficient K and the flow index n of the shortbread dough on the content C% of vegetable extract when replacing sugar (a), fat (b), sugar and fat (c).

When replacing fat and sugar with vegetable extract in the shortbread dough formulation, the flow index practically did not change. However, with the simultaneous replacement of sugar and fat, it changed according to a power law:

$$n = A_3 \times C^{B3} \quad (4)$$

Mathematical analysis of the experimental data processing results showed that the introduction of vegetable extract instead of sugar, fat, both separately and simultaneously, had an effect on the physical-chemical properties of the shortbread dough.

RESULTS AND DISCUSSION

Ultimate shear stress was decreased at 1.33 of sugars; 1.82 of fat; 2.0 of sugar and fat, coefficient of consistency was 1.17; 1.23; 1.85 respectively. The flow index practically changed only with the simultaneous replacement of sugar and fat. Moreover, its numerical value averaged 0.507, i.e. the ultimate shear stress and consistency coefficient decreased, while the flow index increased. Such a change in the parameters of the rheological equations of state for all shortbread dough samples, which did not lead to a change in the nature of the flow curves depending on the content of the plant component in comparison with the control flow curve, characterizes

their difference in deformation behavior only in quantitative terms.

CONCLUSION

Thus, the experimental results on assessment of rheological properties of shortbread confectionery products confirmed the greatest decrease in the strength characteristics of the dough structure that observed with the combined action of sugar, vegetable extracts, regardless of the method and duration of kneading

REFERENCES

1. *Formulations for cakes, pastries, biscuits and rolls: in three parts.M.: Food industry, 1977-1979.*
2. *Collection of formulations for flour confectionery and bakery products for public catering enterprises.M : Economics, 1986, p.295.*
3. *Dolgonova S.V. Improving the technology of centralized production of shortbread dough: Dissertation of candidate of technical sciences. D., 1987, p. 182.*
4. *V.B. Tylkin, I.E. Kononenko, A.B. Dmitrieva. Merchandising of food products. M .: Economics, 1980. - P.38.*
5. *KoryachkinaS.Ya. New types of flour and confectionery products.-Trud. Orel, 2001, p.213.*
6. *Sh.Sh.Sagdullaev, F.I.Inoyatova, A.I.Glushenkova, M.B.Davlyatova, Lipids of zizyphusjujuba fruits Acad.S.YU.Yunusov institute of the chemistry of plant Substances AS RUz «12 th International Symposium on the Chemistry of Natural Compounds», September 7-8, 2017.*
7. *Sh.Sh. Sagdullaev, A.I. Glushchenkova, N.G. Yuldasheva, M.B. Davlyatova. Lipids of sesame oil cake. Reports of Academy of sciences of Republic of Uzbekistan, 2017, p.42-44.*
8. *Dorokhina N.A. Research of influence of composition of fats and some technological factors on the quality of products made from shortbread dough: Author's abstract of dissertation of candidate of technical sciences. M., 1975, p.30.*
9. *L.I.Puchkova, Laboratory tutorial on technology of bakery production. 4th ed. revised and add. L.I. Puchkov. –SPb :. GIORD.2004, p.264*
10. *L. Ya. Aurman."Technology of bakery production". St. Petersburg 2005.*
11. *A.S. Romanov, N.I. Davydenko, L.N. Shatnyuk, I.V. Matveev, V.M. Poziyakovsky."Examination of quality and safety of bread and bakery products" Novosibirsk, 2005.*
12. *A.I. Byvaltsev, Tutorial on course "Modeling and optimization of technological processes in the industry". Textbook, A.I. Byvaltsev, N.M. Derkanosova, A.A. Zhuravlev. Voronezh: VGTA, 2004, p.140.*
13. *Yu.P. Adler, Planning of experiment in the search for optimal solutions, Yu.P. Adler, E.V. Markova, Yu.V. Granovsky M.: "Science", 1971, p.283.*
14. *S.L. Akhnazarova, Methods of experiment optimization in chemical technology. Textbook for chemical-technological specialty universities. S.L. Akhnazarova, V.V. Kafarova. 2nd ed., revised and added. M.: Highschool, 1985, p.328.*
15. *V.V. Nachalov, Statistical methods for planning extreme experiments V.V. Nalimov, N.A. Chernov. Moscow: Nauka, 1965, p.340.*