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PHYSICO-MECHANICAL INDICATORS IN WAFFLE PRODUCTION USING SORGHUM FLOUR

Abstract: *Flour confectionery products occupy the second place among confectionery products depending on the produced volume. They are produced by bakery companies and pastry shops. Flour confectionery products are produced on the flow mechanized and automated lines.*

Key words: *flour, wafer dough, physical processes, dough, sorghum flour.*

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Introduction

Flour confectionery products vary depending on the physico – chemical and organoleptic properties. For example: waffles, gingerbread, cakes and pastries, muffins, biscuits and crackers. These pastries are different from each other, i.e. the wafer-thin wall, thick laminates and high-fat; pastries and cakes-sponge, sandy, layered flour [1].

The physical and mechanical properties of the dough mainly depend on the quality and quantity of the gluten.

Materials and Methods

Preparation of the dough on wafer production is a complex than pasta or bread dough. In addition to water with flour, the composition of the test wafer includes various other ingredients that affect swelling of the flour proteins, sugar, butter, eggs, etc.

Depending on the concentration of the solid solution for kneading the Wafer dough, we can change the level of flour edema and obtain a dough with different physical and mechanical properties [2].

Wheat flour is the main raw material of all flour confectionery products. The main place in the dough from wheat flour is given to gluten. In the kneading processes, a lot of work has been done to study the ability of flour to change the gluten. At the heart of the research to change the quality of the glue in the kneading processes, a certain specific amount of edema of the glue is fixed. When mixing the dough changes the quality and quantity of washed adhesives [3].

According to the results of the study, the plastic properties and stability of the test are determined depending on the properties of gluten; flexible properties of the test depend on the state of starch and starch in the composition. The solid deformation of the first sample depends on the properties of the rigid proteins of the gluten contained in the flour of the highest grade. The figure on the samples №2 and №3 are lower than in the control samples. This is due to the fact that in the test, made from large crushed flour, proteins are completely divided into cases, and the dough №2, tanned from flour made from soft wheat, contains 23.1% of the glue, the remaining proteins are produced by proteins, power indicators characterize the technology of forming the test [4,8].

For the formation of the dough, mainly physical processes occur. The optimal amount of flour adhesives used in thin-layer and thick-layer wafer

production should be 23-26%. From the weak flour in the glue wafers can be obtained with a high sensitivity of absorption of thin water, bulk weight, high surface condition. In the manufacture of thin and thick wafers, the quality of the wafer prepared from flour with a weak glue in quality will be higher than the wafer from flour with a strong and medium glue. In addition, if the wafer is made of flour with a strong glue, the quality deteriorates. The shape varies is not uniform. Therefore, it is advisable to use a special flour with an adhesive content of 23-26% in thin and thick-walled wafer production (30-320sec for PL-2). In the study of the effect of several types of flour samples on the quality of tightly thin-walled wafer samples found that the wafer affects the color and grade of flour. Waffles, made from flour 1stgrade, differ from the waffles, made from flour and2nd grade. In the wafer made from 2nd grade flour, have a dense roughness, matte color, on the surface of the wafer observed glued bran. With a decrease in the grade of flour, the temperature of the product decreases, the ability to absorb water increases [5,6].

The quality of thin-walled wafer species affect the types of grinding flour. Thin-walled wafers made from flour of high fineness of grinding, have a rate of absorption of water in relation to the wafer prepared from soft fine milled flour, less than fine flour. Therefore, such flour should be used in the form of thick layered wafers [7,9].

Mixing finely milled flour coarsely milled flour within a given range does not require the need to adjust the consistency of the dough with a change in the amount of sugar [10].

Coarsely crushed flour should be coarse, prepared from light pink wheat, meet the following indicators: in the silk screen №27 the residue should not exceed 5%, and in the bucket №43-no more than 15%.

The stability of the Wafer dough varies at the same humidity and temperature within large limits and depends on the quality of the glue contained in the flour. The dough with a weak glue (flour 25% of the adhesive) viscosity of 3.5 p. s; the dough binder with increasing content of the glue by up to 32% 20p.at rise 46% viscosity at 28 p. s will be. The viscosity of the dough from flour made from flour on average 25% glue, 12.5 p. W was. The dough of wafer layers prepared from 25-32% flour containing a weak glue, Matures well and represents a volume mass of 0,264-0,285 g/cm-bars. With a weak glue content of 46%, the dough has a low tensile viscosity and does not ripen well. The bulk of the wafer layers is increased to 0.31 g/cm In the technology of wafer production has a value of the viscosity of the waffles. If the dough has a high viscosity, the dosage is not cooked correctly, without crushing the monotony flowing from the wafer form. Therefore, the viscosity of the dough is known and may be stable at about 10-11 p. When using flour, the quality of which differs from the amount of glue, it is necessary to change the humidity of the dough and increase the amount of glue, but increasing the humidity of the dough, increasing the duration of cooking. This, in turn, is inefficient. Indicators of the quality of wheat flour of the highest grade are given in 1 figure.

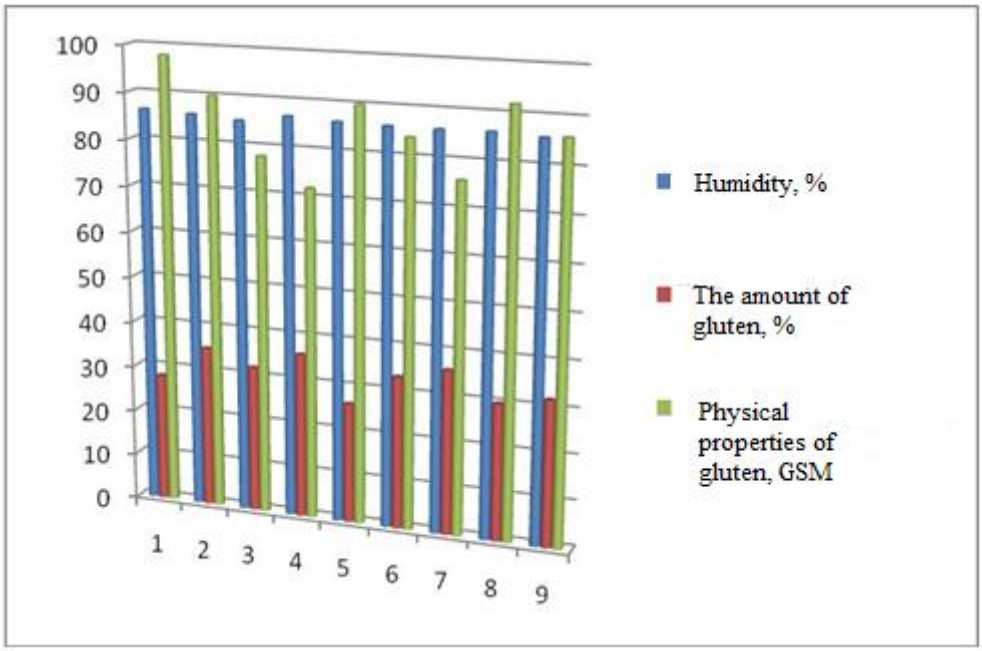

Figure 1 - Quality indicators of wheat flour of the highest grade

Thin-layer wafers are made of loose elastic dough with easy formatting to a predetermined shape and maintained for a long time. The elasticity of thin layers depends mainly on the amount of sugar and oil, which limit the swelling of the glue proteins and depend on several low humidity. Along with the fat content in the dough with sugar, the flour content depends on the level of grinding moisture in the formation of the dough that can absorb water, as well as the quality of the adhesive proteins. The dimensions of the flour parts affect the rheological properties of the dough, in the presence of a part of the flour, the amount of water contacting the powder decreases. In the production of thin-layer wafers, the use of 28-36% flour with a weak glue content is effective.

Unlike wheat flour Sorghum, rice, barley, corn flour proteins do not form gluten, but in most cases is not flour that meets the requirements for the content of gluten and the effective use of flour. Therefore, one of the ways to reduce the protein content, i.e. gluten is the use of low-quality flour bakery, provided that its content exceeds 36%.

The aim of the study is to study the effect of used sorghum flour on the thin layer of wafer and fixing the optimal amount. As an example of the adoption of I and II weak flour strength contained in 35% gluten, it is recommended to use in the production of thin layers of flour with an adhesive content of 28-36%.

Dough samples of thin-walled wafers instead of wheat 5%, 10%, 15%, 20% sorghum flour was added. The recipe for the preparation of Waffles is shown in table 3. In the process of rolling, forming, baking dough based methods removed in sections 2.2.3, 2.4. The quality of the test was evaluated by the following indicators, humidity, temperature, elasticity, stability, and in assessing the quality of the following moisture and density indicators were determined.

The amount of flour for all the respondents listed in Figure 1 can be explained by the size of the flour and its potential.

Table 1. Effect of the amount of sorghum flour on the quality of thin-walled wafers

№	Indicators	Observation		Prototypes with sorghum flour			
		1	2	5	10	15	20
1	Gluten of the flour, quantity,%	28	35,2	-	-	-	-
	The physical properties of the gluten, GSM	90	87,0	-	-	-	-
2	Dough	18,0	18,0	18,2	18,3	18,1	18,4
	humidity,%	26,0	26,0	26,0	26,0	26,0	26,0
3	temperature	8.10	2,8.10	9,0.10	9,5.10	1,5.10	2,0.10
	Indicators of waffles						
	Humidity, %	4,6	4,5	4,7	4,4	4,8	4,5
	absorption, %	180	170	178	176	174	172
	density, gram	0,55	0,60	0,58	0,59	0,62	0,63

In the study of dough samples, the following data were obtained: an increase in the amount of sorghum flour when replacing wheat flour with sorghum flour and a decrease in the amount of gluten of the test while reducing the content of the control sample, improving the elastic properties of the product.

The surface of all wafer samples added by milled Sorghum is homogeneous, but the addition of sorghum flour in an amount of more than 10% does not affect the swelling and density, but the color is matted slightly. Therefore, it is optimal to add 5-10% doses in the preparation of fine layered sorghum flour. Next, we studied the effect of the amount of counter flour on thick layers. These wafers are made of Medium flour with an adhesive content of 32-34%. When performing the work, medium-sized glue flour was used. Table 5-theoretical information is presented on the quality of wafers and dough made from glued flour.

The viscosity of the dough of the prototypes is reduced than when using wheat flour, than with increasing the amount increases. In accordance with this change flexibility. Flexible dough can be seen on the control samples with an average amount of glue 32%. When making the dough control samples from the Middle of the flour and when the content of the adhesive average 36%, the content of adhesive test samples is higher compared to the average flour 32%.

On test samples, when replacing part of the flour with an adhesive content of 36%, a decrease in the stability of the dough with flexibility was observed.

The study of samples of the wafers were observed the following indicators: swelling of the flour No. 3 control sample compared to the control flour No. 4 high -, low density-163, and waffles, replaced with flour sorghum 5-10% of samples, compared to samples prepared with wheat flour №4 are high in terms of viscosity analogues of the type 3-safli.

All prototypes are well distributed, waffles from flour №4, replaced by 5-10%, were better than others.

The improvement of the quality indicators of the fineness of the flask prepared by replacing part of the wheat – sorghum flour, high brittleness and prepared by force from Medium flour, is explained by the decrease in proteins added together with the flour, which in turn improves the elastic properties of the dough for viscosity, puffiness and density.

In the production of thick puff a great influence of glue. When using medium and strong adhesive flour in a thick layered plasty wafer reduce its elasticity, resulting in the dough pieces are deformed, the resulting products have cracks, the surface is not uniform, and these reverse effects are largely present when using strong flour in the gluten.

Use subclassa the flour with the contents of a thick layer valida 32-34%. In this case the dough becomes elastic and soft in certain quantities, with the result that the dough pieces are not cracked, therefore, studied the effect of sorghum flour on avaliku when combined with subclauses flour in the production of thick layered flour.

Reduced sample density by adding sorghum flour by 10%. This is due to the reduction of protein content in wheat flour when replacing parts sorghum flour, the influence of the low ability of degradacii in the formation of test of adhesives, although the composition of sorghum flour contained medicinal substances.

All wafer samples in the manufacture of flour with a weak glue have a contour without a uniform surface level.

As a control sample, weak flour with an adhesive content of 33.4% and 36% flour with an average glue as a test sample were used in the research work.

According to the conducted studies, the thin – elastic – astringent properties of wheat flour wafers with an average glue content will be lower than wafers from weak-adhesive flour. When replacing wheat flour 5 – 10% sorghum flour significantly improves the properties and properties of the dough. Build vaglini in prototypes swelling lower than vallespi made from wheat flour average quality.

The conducted studies have led to the following conclusion: if the use of low-adhesive flour indicators are higher, that is, the glue content exceeds 32%, it is recommended to use 5 - 10% of sorghum flour. When replacing 5 – 10% sorghum flour improves the physical and chemical properties of the dough and meets the requirements for it.

The problems of intensification and optimization of technological processes remain relevant today and are the basis of technological progress. The quality of the wafer layers is influenced by the composition of the raw material formulation, production technology and physical and mechanical properties when mixing the dough.

In addition, the quality of the wafer layers is affected by the interaction of dough modes and the quality of the flour used. For the production of wafer layers, it is necessary to use flour with a weak adhesive content of 32%.

The properties of confectionery production have a significant impact on the course of the process and the quality of wafer layers: wheat flour, egg products, humidity, the intensity of embarrassment. The quality of the wafer dough is based on the quality of flour. For the physical properties of the glue from the physical properties of the test depend on the structural and rheolytic properties of the test. When adding flour from wheat flour specified in the formulation of the Wafer dough, sorghum flour proteins can change the rheological properties of the dough due to the fact that they do not form glue. In turn, the structure of these burial grounds intensifies the direct ability.

In addition, the addition of a small amount of sorghum flour will create biologically valuable food products, which leads to an increase in the value of nutrition by adding additional necessary biological substances.

The purpose of this work is to study the possibility of technological intensification of the preparation of wafer dough using sorghum flour and reducing the amount of sugar. To study the effect of the viscosity of the dough, we replaced 5 – 10% sorghum flour from wheat flour and made the dough. The dough control and test samples were made for 12 minutes by swinging 270 Rev/min. After 5, 8, 10, 12 minutes sampling and determination of the structural mechanical properties of the wafer dough.

In the course of studies, the amount of gluten 30% using flour of GSM 90 with a gluten content of 32%, wheat flour from GSM 84 with a grinding duration of 10 minutes. Flour samples are made of flour with a glue content of 32%. The effect of sorghum flour on the stability of the wafer dough is given in table 2. On viscometer RV-8 studied the design properties of the wafer test.

Table 2. The effect of flour on the stability of the wafer dough.

Description of the dough	Description of the experiment	Stability,	Movement speed, s
High-grade flour with glue content 30%	Observation 1	17,0 12,0 13,5	15,0 40,0 60,0
High-grade flour with glue content 32%	Observation2	18,6 16,5 15,5	10,9 40,0 77,14
	5% of sorghum flour	15,27	14,5
	experiment	14,84 12,75	39,45 87,5
	Experiment with 10% sorghum flour	16,12 14,02 13,2	13,2 41,8 86

Conclusions.

The maximum power and viscosity of the wafer dough depends on the amount of sorghum flour. When you add 5-10% Sorghum flour reduced the viscosity of the dough. In contrast to the control samples from the flour of the highest grade with a glue content of 30%, the test viscosity made from flour containing 5-10% sorghum flour, while allowing this dough to intensify in the mixing process without increasing the humidity to 67%, and also compresses the duration of mixing the dough.

References:

1. Aubakirov, H. A., & Trepov, A. A. (n.d.). *Result of Introductions and Crimean Utilization in the South of the Republic of Kazakhstan "UZNIIZhiR"* JSC "KazAgrnnnnOr" Kazagr.
2. Lurye, I. C., & Sharov, A. I. (2001). *Technological control of raw materials in the catalog production*. Moscow: Kolos.
3. Lurye, I. C. (2003). *Handbook for technical chemistry in the cataloging industry*. Moscow: Pishchevai ploshmilennosti.
4. Skobolskaya, Z. G, & Gryacheva, G. N. (2002). Technology of professional of reporting products. (p.416). Moscow.
5. Chizhova, K. N. (2000). *The chemical industry control of the horticultural industry*. Moscow: Food processing industry.
6. (1998). *A reference of the index h I. Syndrome and technology of the index production*. (p.713). Moscow.
7. (1999). Reference Guide II. *Technological equipment of companies industry*. (p.816). Moscow.
8. Polutornova, T. I., Shvedova, A. V., & Litinsky, A. M. (1979). *Manufactured sanitation and air conditioning equipment of food processing enterprises*. (p.317). Moscow.
9. Shtomina, M. M., Sokolovskaya, G. G., & Taleyskikh, M. A. (1980). *Waffles*. (p.393). Moscow.
10. Dragilev, A. I., & Marshalkin, G. A. (1999). *The core of the brand production*. (p.446). Moscow.