TECHNOLOGICAL ASPECTS IN THE PROCESS OF MANUFACTURE OF BAKERY PRODUCTS WITH THE ADDITION OF WHEAT BRAN

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Abstract: In this work were studied qualitative indices of the raw material in the baking industry and the influence of addition dietary fiber (wheat bran) on the physical–chemical indices of doughs made from wheat flours.

Keywords: wheat flour, dietary fibre, wheat bran.

Introduction

For enlarging the assortment of products enriched with fiber the most focus is on bakery products. As is well known that the basic raw material for the production of bread has high calorific value and refined.

For the enrichment of bakery products with fiber is added various amounts of bran or bran products, cereal groats or other sources of fibre, such as: grain seeds, germinated or not, sesame seeds, anise, coriander, flax, soybean ground shells etc.

The most comfortable way of spiking food with dietary fibre is adding cereal or bran at white flour. This is convenient from the technological point of view, didn't require the modification of the schemes for grinding and allowing a strictly contribution controlled by fiber, and from sensory point of view it is better accepted by consumers, a product in which the fibers controls a white background than a dark product [3].

The characteristics of wheat bran which is bounces and over products that were supplemented with these, induce different physiological answers, with beneficial effects on health. In comparation with existing fibre in other cereals, wheat fibers have more pronounced effects on the colon in terms of reducing the concentration of bile acids, mutagenic compounds and carcinogens, inhibiting further result in putrefaction bacteria. Is considered that both some components such as lignin and cellulose as well as structural features of wheat bran are factors responsible for reduced fermentability of fibers from wheat and their high capacity water binding, the bile acids and toxic substances [4].

Materials and Methods

For inquiries, we used the following raw materials and auxiliaries: wheat flour of I quality, yeast, salt, dietary fiber (wheat bran), water.

Organoleptic analysis of raw materials, especially wheat flour, intended for the production of bread with added bran, we used the following methods: method for the determination of flour and bran color [GOST 27558–87], [STAS 90–95 points. 3], [1], [5]; method for the determination of flour and bran smell [GOST 27558–87], [STAS 90–95 points. 3], [1], [5]; method for the determination of the flour and bran taste [GOST 27558–87], [STAS 90–95 points. 3], [1], [2]; method for the determination of infestation of pests barn flour [STAS 90–95 points. 3], [1], [2].

Physico–chemical analysis of flour and wheat bran, designed for study of development of dietary bakery products, have been applied the following methods of determination: determination of fineness wheat flour [1], [2]; determination of ferromagnetic impurities [1]; determination of moisture (GOST 9404 STAS–88, 90–95, point.7) [1], [2]; acidity determination by titration of aqueous suspension (GOST 27493–87) [1].

In order to assess the quality of the semi–finished products was determined moisture and titrated acidity. We have carried out experimental tests, depending on the amount of added bran (3, 5, 7, and 10 percent of the mass of wheat), with subsequent analysis of indices and on the basis of their physico–chemical. He also traced the influence of degree of fineness of wheat bran on the quality of index of finished products [1].

Results and Discussion

Carrying out tests in laboratory conditions, with the addition of wheat bran, has appreciated the physico–chemical and organoleptic quality of flour and wheat bran.

The results are presented in table 1, 2 and 3.

Table 1. Experimental results of organoleptic analysis of wheat flour of I quality and wheat bran

Organaleptic index	Characteristic of wheat flour	Characteristic of wheat bran
Colour	White Colour, characteristic of quality I flour	Red–yellow colour with a grey shade
Smell	Pleasant smell, specific to healthy meal, without the smell of mold or other foreign, without extraneous odours	Specific bran smell, without strange smell and withouat mold smell
Tastes	Taste slightly sweet without sour or bitter taste and without squealing at mastication	Specific taste of bran, without foreign, sour or bitter taste
Infestation with mites	*I*s not infested with insects or mites	Is not infested with insects or mites

Table 2. Experimental results of physico–chemical analysis of wheat flour quality I

Physico–chemical indexes	Characteristic of wheat flour
Grain wheat flour, %	Characteristic of wheat flour quality I
Ferromagnetic Impurities, mg/1 kg	2,4
Moisture, %	14,5
Acidity, degrees	3,8

The results showed that the flour used for obtaining samples corresponds to the terms of quality I flour. From the analysis of physico–chemical properties of the flour was obtained a corresponding standard humidity. This index is important in defining the quality of the flour as influence both the preparation and processing of semi–finished product and yield of bread. Due to the hygroscopic character, flour during storage change upside humidity or decrease it. Thus, reducing the moisture of the flour with 1 %, it reduces the efficiency of the dough with 1,5 %.

In terms of the acidity of the flour used, was obtained a rate of 3,8 degrees. This index exceeds the limit of 3,5 degrees of acidity for wheat flour quality I.

Table 3. Experimental results of organoleptic analysis of wheat flour quality I and wheat bran

Quality indexes	Wheat bran	
	coarse	grouts
Moisture, %, max.	14,4	14,4
Harmful impurities content, % max.	Not allowed	Not allowed
Acidity, degrees, max.	6,0	5,8
Magnteic metal impurities, mg. In 1 kg of flour: – with isolated particle size maximum linear extent 0.3 mm and (or) max weight. 0,4 mg, max. – the size and mass of isolated particles larger than the values indicated	2,8 Not allowed	2,4 Not allowed
Harmful infestation of grain reserves	Not allowed	Not allowed
Harmful infestation of grain reserves	Not allowed	Not allowed

Bran humidity used in preparing the bread has moisture content of 14,4 %, according to the State standard, this value must be not more than 15,0 %.

Recipes of experimental samples, but also the description of technological parameters is shown in table 4 and 5.

Table 4. Experimental variants for getting the dough with the addition of bran

Experimental tests	Raw materials and auxiliaries, 400 g of flour						
	Flour, g	Yeast, g	Salt, g	Bran, g	Water into the yeast suspension, ml	Water into the salt solution, ml	Water into dough, ml
PM: bread of wheat flour quality I	400,0	12,0	6,0	–	36,0	17,0	161,4
P1: sample with addition of 3 % wheat bran	388,0	12,0	6,0	12,0	36,0	17,0	161,37
P2: sample with addition of 5 % wheat bran	380,0	12,0	6,0	20,0	36,0	17,0	161,5
P3: sample with the addition of 7 % wheat bran	372,0	12,0	6,0	28,0	36,0	17,0	161,36
P4: sample with addition of 10 % wheat bran	360,0	12,0	6,0	40,0	36,0	17,0	161,5

Table 5. Description of the technological parameters for getting the dough with the addition of bran

Technological parameters	
During the kneading	5 – 10 minute
During the fermentation	170 minute
Duration leavening	40 – 70 minute
Leavening temperature	30 – 32°C
During baking	30 – 60 minute
Temperature for cooking	200 – 220 °C

The dough was prepared by monophasic method. At doughs kneadings with added wheat bran, a certain amount of wheat flour has been substituted with the bran, to establish the amount of flour required was accomplished by recalculating dry substances. The amount of yeast by 3% and 1,5% salt and wheat scalded bran (3, 5, 7, and 10 percent of the flour weight) was administered to dough kneading stage, which is 44,5% humidity.

The experimental results obtained on the analysis of finished products, are presented in the figures below.

The humidity of the dough directly influences the duration of kneading because the wetness of the dough is higher with both kneading length decreases as a result of the fact that in the presence of water in greater quantities gluten is formed faster, and standardize the various components is achieved faster. Increased moisture causes the consistency, reducing bottlenecks that further processing of dough and influence negatively on the quality of bread.

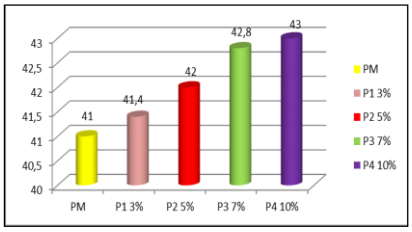

Fig. 1. Dependence of the addition of dietary gross fiber in different percentages to moisture of dough, %

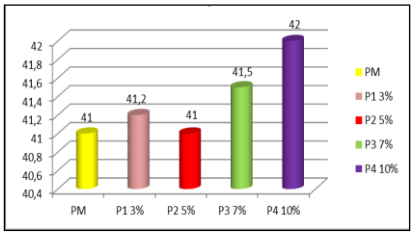

Fig. 2. Dependence of the addition of dietary fine fiber in different percentages to the moisture of dough, %

Analyzing the obtained results we can say that moisture dough gradually increases with the addition of bran, this is notable in the case of samples analyzed with the addition of 3, 5 and 7% of bran, but with the increase of the amount of bran, at the adding of the amount of 10% of bran, there is a rise in humidity compared to previous tests, as shown in the chart at all the samples were recorded higher values than in the blank. Increase the humidity of the dough is explained by the fact that the fibers have the ability to absorb water and to maintain it in the product.

Samples with the addition of 5 and 7% in both cases, dietary fiber and coarse and fine wires have an increased humidity. Fibers affects the machinability of the dough and, as a result of reducing the content of gluten, dough becomes more sticky at the same consistency, making it more difficult to machine.

Complications may arise due to the intake of chemical compounds, microbial load or enzymes with which fibers coming in the dough. Thus, amylases or exogenous proteases may result in a further weakening of the dough which causes getting meaty products wet and tacky, inappropriate volume.

As noted bran causes an increase of hydratation capacity of the flour, which in economic terms, is an advantage because the same amount of flour can get more products.

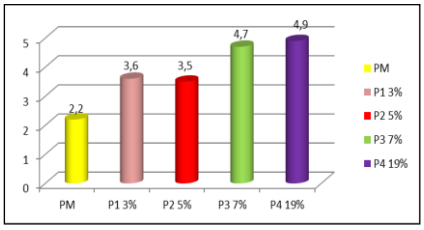

Fig. 3. The dependence of the addition of dietary coarse fiber in different percentage to the acidity of the dough (degrees acidity)

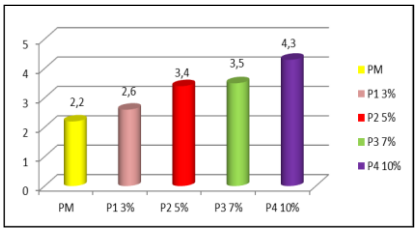

Fig. 4. Dependence of addition of dietary fiber in different per cent at the acidity of the dough (degrees acidity)

As it appears after charts the acidity increases with the increase of amount of addition of bran, therefore increasing the acidity is in a dependency directly proportional to the increase in the amount of wrapping bran. This increase in acidity is explained by the fact that with the increasing amount of bran, in flour falls some proteins and increased acidity takes place.

Analyzing the obtained experimental results we can say that the samples with the addition of coarse bran have a higher acidity in comparison with the samples with the addition of trivial bran, explaining that the coarse bran are lighter and the same weight falls a greater amount of bran. The acidity from the samples with rough bran is higher by 1.2 percent, compared with the paltry bran samples. The samples with the addition of 10% bran are the highest values. Increasing acidity is explained by the fact that the introduction of the bran, take place lactic fermentation in result is obtained lactic that leads to increased acidity.

Conclusions

The results showed that the flour used for obtaining analyzed samples corresponding with terms of quality I flour. From the analysis of physico–chemical properties of the flour was obtained a corresponding standard humidity. Bran humidity used in preparing the bread has a moisture content of 14,4 %, according to the State standard, this value must be not more than 15,0 %.

In terms of the acidity of the flour used was obtained a rate of 3,8 degrees. This index exceeds the limit of 3.5 degrees of acidity for wheat flour quality I.

Analyzing the obtained results concerning the influence of the addition of bran on the quality of production, we can affirm that the humidity of the dough gradually increases with the addition of bran, this is notable in the case of samples analyzed with the addition of 3, 5 and 7 % of bran, but with the increase in the amount of bran, the determination of the amount of a 10 % increase in moisture compared with previous samples.

The addition of bran causes an increase in capacity of the flour, which in economic terms, is an advantage because the same amount of flour can get more products.

The study showed that the samples with the addition of bran coarse have a higher acidity in comparison with the samples with the addition of trivial bran, explaining that the coarse bran are lighter and the same weight falls a greater amount of bran. The acidity from the samples with course bran is higher by 1.2 percent, compared with the paltry bran samples. The samples with the addition of 10 % bran is the highest values.

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