

THE INULIN AND OLIGOFRUCTOSE EFFECT ON QUALITY PARAMETERS OF BIG DARK AND WHEAT BREAD FUNCTIONAL PROPERTIES

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To determine the expediency of inulin and oligofructose use as an additive giving the bread functional properties, the effect of inulin and oligofructose on quality parameters of big dark and wheat bread.

Keywords: inulin, oligofructose, additive, dark and wheat bread

The development of functional purpose bakery products using food fibers, obtained from readily available raw materials, that could have a positive effect on the human organism, improve the quality of the products under development, output, and thereby increase the competitiveness of products is an important task for today.

In this regard, it is expedient to use inulin and oligofructose, which are products of the processing of chicory and Jerusalem artichoke growing in the most of European regions.

The purpose of research is to develop technologies for production of wheat and rye-wheat bread of functional purpose using inulin brands Beneo HP, Beneo GR and oligofructose brand Beneo P 95.

Rye-wheat dough is prepared with a thick rye sourdough, three-phase method of the brew injection being used, wheat dough is prepared on a big thick brew. During the research, inulin and oligofructose are introduced in the powder form and in the restored form in the amount of 2,0; 3,0; 4,0% of the flour weight. To restore the powder of the inulin brand Beneo HP, one mixes it with water under the temperature of 30°C with a ratio of 1:3 to obtain a gel consistency for 5 minutes at least and one proofs the mixture obtained for 1 hour at least. The powder of the inulin brand Beneo HP being used, one mixes it with water under the temperature of 30°C with a ratio of 1:3 for 5 minutes at least and one proofs the mixture obtained for 1 hour at least. The oligofructose brand Beneo P 95 is mixed with water under the temperature of 30°C with a ratio of 1:3 and the mixture obtained is proofed for 1 hour at least.

When preparing big dark bread, inulin (oligofructose) is injected into the brew immediately after brewing in the restored or powder form. When preparing wheat dough, inulin (oligofructose) is introduced in the restored or powder form while the brew or the dough are mixed.

Inulin and oligofructose affect on quality parameters of final products

On the grounds of laboratory test baking the conclusion was made that the best way

to introduce inulin and oligofructose for baking rye-wheat bread is to introduce these fibers in the restored form into the brew, right after brewing in the amount of 3% by weight of flour. To bake wheat bread, it is expedient to inject inulin and oligofructose in the restored form in the amount of 3% by weight of flour when kneading the dough.

These ways to add the fibers in question provide the best organoleptic and physico-chemical quality of bread, much higher than in control samples. For the rye-wheat bread oven loss is reduced by 0,3% when injecting brand inulin Beneo HP, by 2,0% when you inject Beneo GR and by 1,3% when oligofructose Beneo P 95 is used. When baking wheat bread with the introduction of inulin mark Beneo HP oven loss decreases by 0,9%, when you use Beneo GR – by 1,3%, as to the use of oligofructose Beneo P 95 oven loss decreases by 2,6%.

The drying up during the preparation of rye-wheat bread decreases by 1,0% when Beneo HP is used, it remains the same when you add Beneo GR, and decreases by 0,7% when Beneo P 95 being used. When preparing wheat bread with the injection of inulin brands Beneo GR and Beneo HP the drying up does not change, compared with the control sample, and the use of oligofructose Beneo P 95 makes the drying up decrease by 1,1%.

When baking rye-wheat bread with the use of brands Beneo GR, Beneo HP and Beneo P 95, one can find the bread output rising by 5,1; 5,3 and 4,7% in comparison with the control sample. When baking wheat bread, this increase is respectively 2,4; 6,6 and 11,3%.

When baking rye-wheat bread, the specific volume of bread increases by 9,0% when Beneo HP is used, by 14,1% with the injection of inulin Beneo GR and by 15,3% when using oligofructose Beneo P 95. As to wheat bread, specific volume increases by 12,8% with the injection of inulin Beneo HP, by 0,8% with the injection of inulin Beneo GR and by 7,2% with the injection of oligofructose Beneo P 95.

The samples of rye-wheat bread were subjected to further analysis samples when dietary fiber was added in the quantity of 3% by weight of flour in the restored form into the brew just

after brewing. To prepare wheat bread, one uses 3% of fiber in the restored form, the fiber being put into when mixing the dough.

On the grounds of the analysis of structural and mechanical properties of packed big dark bread crumb it was found that the addition of inulin brand GR increases the shelf life in 14 hours, the use of oligofructose Beneo P 95 – by 42 hours, and inulin brand HP – by 46 hours compared with the control sample. Injecting inulin brand GR increases the shelf life in 14 hours, the addition of oligofructose brand P 95 – in 48 hours, and inulin brand HP – in 42 hours compared with the control sample for unpacked rye-wheat bread. Using inulin brand Beneo HP and GR in the production of wheat bread leads to a reduction in the shelf life in 16 and 8 hours respectively, and as to oligofructose P 95 used, the shelf life increases in 18 hours compared with the control sample for unpacked bread. When analyzing the data obtained about packed wheat bread, the conclusion was made, that the addition of inulin brands Beneo HP and GR reduces the shelf life in 16 hours, and oligofructose Beneo P 95 being used, the shelf life increases in 12 hours compared with the control sample.

Studying digestibility of bread, the fact that the introduction of inulin and oligofructose does not influence the digestibility of pro-

teins was proved and, in all cases, the change in optical density (y) depending on the duration of hydrolysis (x) of extract of rye-wheat bread crumb was described with the equation:

$$y = 0,002x + 0,061,$$

when $R = 0,947$.

For wheat bread similar equation has the form:

$$y = 0,004x + 0,057,$$

when $R = 0,994$.

To characterize the aroma of bread the contents of bisulfite binding compounds in the finished bread was examined. It is clear that the content of aroma compounds increases compared with control samples, and the lower the degree of polymerization of the molecules of inulin and oligofructose is, the higher is the content of bisulfite binding compounds.

On the grounds of data obtained from determining of aerogenous ability of flour and aroma compounds in the bread, the conclusion can be made that inulin and oligofructose are partially hydrolyzed in the bread production. To state the expediency to use inulin and oligofructose as an additive that increases the content of dietary fibers in bread, the degree of hydrolysis of inulin and oligofructose molecules in the final products is determined. The results are presented on the Table.

The maintenance raffiline and raffilose in bread

The indicator name	The residual maintenance inulin (oligofructose), %	
	In 100 g bread	In recalculation to 100 g flour
The sample with using of 3% HP:		
The big dark	1,96	2,8
The wheaten	2,07	2,7
The sample with using of 3% GR:		
The big dark	1,74	2,5
The wheaten	1,81	2,5
The sample with using of 3% P 95:		
The big dark	1,45	2,1
The wheaten	1,49	2,1

Despite the significantly difference in the acidity of the rye-wheat and wheat bread and different duration of the period during which the inulin (oligofructose) is under aggressive environmental conditions, their degree of hydrolysis is the same and depends on the degree of polymerization of molecule. This proves the assumption that only mono- and disaccharides are fermented in the process of mixing the dough and glucose residues at the ends of inulin and oligofructose molecules are split off, with β (2 \rightarrow 1) relationship between the molecules of anhydrofructofuranose being unaf-

ected by acid or enzymatic hydrolysis in the dough.

In determining the content of soluble and insoluble fiber in bread, the fact was found, that the use of the inulin brand Beneo HP, possessing the solubility which is less than 20 g/l, increases mainly the content of insoluble dietary fibers, and when you add the oligofructose Beneo P 95, possessing the solubility which is more than 750 g/l, the content of soluble dietary fibers increases mainly.

If you use 100 grams of rye-wheat bread daily, the need of food fibers is satisfied by

more than 30%, and using white bread, the need of soluble dietary fibers is satisfied. Consequently, the use of inulin and oligofructose is expedient for bread to be given its functional properties.

The calculation of complex quality parameter shows that despite the slight decrease in the content of some dietary factors in the test samples, when adding the inulin brands Beneo HP and Beneo GR and the oligofructose brand Beneo P 95, the complex parameter of the quality of

rye-wheat bread increases in 7.3;11.2 and 12.5%, respectively, and when making wheat bread, the growth is 5.5, 3.1 and 5.5, respectively.

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