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Influence of S. Cerevisiae Yeast as a Part of the Recipe Component of Flour Confectionery on the Quality of Deep-Fat Frying.

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ABSTRACT

Products prepared in the deep-fat frying way are fried in a significant amount of fat therefore fat plays an important role in the technology of their production. Besides, fat is not only a heat-transmitting substance, but it is also one of the main product's components defining its properties and nutrition value. In order to investigate the influence of *S. cerevisiae* yeast, being a part of flour confectionery products' recipe, on the quality of the deep frying, there was carried out a process of continuous frying of semi-finished products in it. A set of the received results testifies that in the conditions of a four-hour deep frying deep fat undergoes changes in its quality indicators, the severity of which depends on the composition of experimental semi-finished flour confectionery samples. On the basis of the lipid oxidation degree indexes research (peroxide value, the amount of peroxide, presence of diene conjugates and ketodienes) it was found out that the use of *S. cerevisiae* yeast in the flour confectionery allowed to extend the term of deep fat using compared to the deep fat, in which were prepared experimental semi-finished flour confectionery samples, according to a traditional recipe without yeast, i.e. organic acids secreted by yeast during the fermentation of the dough act as a synergist of antioxidants and thus contribute to slow the process of deep fat peroxidation while using, thus reducing the rate of oxidative destruction processes in deep fat.

Keywords: deep fat, *S. cerevisiae* yeast, peroxide value, dieneconjugates, ketodiens.

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INTRODUCTION

Human health depends largely on the character of human nutrition and, mainly, on the provision of a human body with vital substances the source of which can be *S. cerevisiae*. The yeast is characterized by a high protein, vitamins and minerals content in an optimally balanced combination, as well as the presence of glutathione - antioxidant [1, 2].

Besides, during fermentation *S. cerevisiae* yeast emits the carbon dioxide, loosening dough and the following metabolism products: acetic, formic, succinic, citric, tartaric, oxalic, malic acid and other organic acids, which may slow down the oxidation of fat during the deep frying [3].

It is well known that products prepared in the deep fat are fried in a significant amount of fat therefore the quality and composition of fat play an important role, defining the quality of the final products [4, 5]. Cooking oils lose their initial properties in the process of deep frying due to the reducing of the organoleptic indexes and changes associated with the lipid peroxidation. It should be noted, that continuous presence of the fried semi-prepared products accelerates deterioration of cooking oil, because of the moisture released into the heated deep fat and also due to the parts of dough getting into oil from the surface of the fried semi-finished product.

In view of the above, the objective of this paper was to study the effect of *S. cerevisiae* yeast as a part of the recipe of flour confectionery products on the quality of deep-fat frying in the process of continuous frying of semi-prepared products.

MATERIALS AND METHODS

After deep-fat frying of the experimental semi-cooked products, according to a traditional recipe, the deep fatwas considered to be a control sample and the oil in the deep-fryer, left after preparing semi-cooked products, with the addition of *S. cerevisiae* yeast into the recipe of flour confectionery products, was taken as an experimental one. Frying was carried out continuously for 4 h without any oil addition after preheating of the deep-fryer for 7 min. Experimental semi-prepared products were submerged into the boiling deep fat where they were fried thoroughly at 170±2 °C till a slightly yellowish color of a semi-finished product for 2-3 min.

To assess the oxidation processes occurring in the deep fat, the amount of peroxide was determined by the method of GOST 26583-85 and was calculated peroxide value (PV). The degree of unsaturation and oxidation of lipids was evaluated by the content of diene conjugates (DC) and ketodienes (KD) in a spectrophotometer UV-3101 PC (SHIMADZU Company), based on the ability of conjugated double and triple bonds to strongly absorb in the ultraviolet area with characteristic peaks. The quality of deep fats was evaluated by organoleptic point scale, taking into account the significance of the coefficients of importance (taste coefficient of importance - 3, smell– 3, colors - 2).

RESULTS

The continuous 4-hour process of deep frying with a permanent presence of experimental semi-finished product was accompanied by a change in its organoleptic characteristics. With increasing the time deep fat usage, both in the control and experimental samples was observed the change in color, taste and smell, which amplified and acquired the colors, not typical for the initial samples (Table 1), this fact is coordinated with the data presented in the list of literature [6, 7].

The results of the carried-out organoleptic assessment showed that control samples of deep fat underwent significant changes of indexes(there was a distinct unpleasant smell peculiar to products of fat's thermal degradation) after continuous 3-hour using, while experimental deep fat samples- only after 3.5 hours.

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Table 1: Organoleptic evaluation of deep fat

Index	The duration of use, in hours	Points	
		Control	Experimental
Average evaluation point of the quality of deep fat during 4 hours of using	0	5.0	5.0
	0.5	4.8	5.0
	1.0	4.2	4.2
	1.5	3.4	4.2
	2.0	3.0	3.6
	2.5	3.0	3.4
	3.0	3.0	3.0
	3.5	2.6	3.0
	4.0	2.0	2.6

Deterioration of oils' organoleptic characteristics was also followed by a change in their physical and chemical characteristics describing the state and quality of vegetable fats. Indicators of the oxidizing processes that occur in deep fat while frying was evaluated by the number of peroxide value, the amount of peroxide. Analysis of the initial deep fat physical and chemical characteristics before and after heating at 170 ± 2^0Cfor 7 minutes is shown in Table 2.

Table 2: The effect of heating on the quality of deep fat

Index	Initial deep fat	Heated deep fat
Peroxidevalue, % I	0.047 ± 0.002	0.051 ± 0.005
The amount of peroxide, [ROOH], mmol/ g	0.002 ± 0.001	0.002 ± 0.001

Table 2 shows that the heating of deep fat for 7 minutes before the introduction of experimental semi-prepared samples does not cause significant changes in PV and in the amount of peroxides.

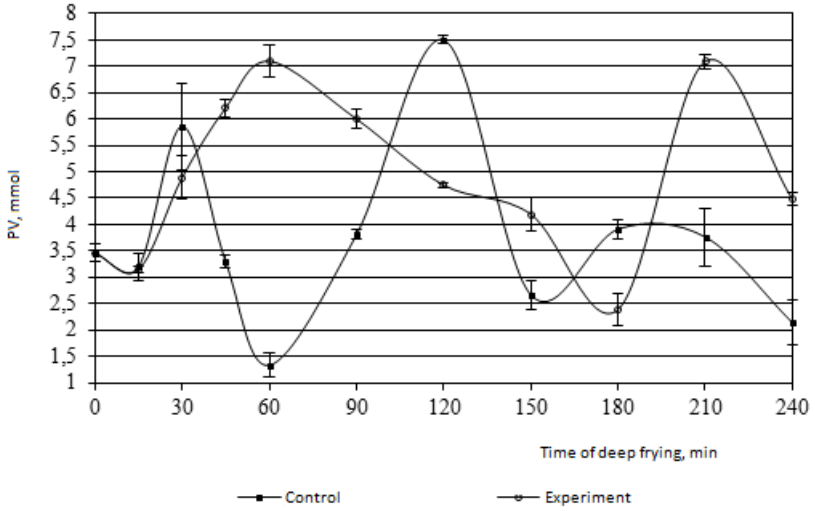

Figure 1: The change of peroxide value in the process of semi-manufactured products' deep frying

Figure 1 shows the change in peroxide value of deep fat in the process of 4-hour frying of experimental semis. Analysis of the peroxide values of deep fat using revealed the extreme nature of the index change both while frying the semi-cooked food, according to the traditional recipe, and using the yeast*S. cerevisiae* as a part of flour confectionery product's recipe. Significantly lower rates of increase in peroxide values of the experimental deep fat samples, in which the semi-finished products were prepared, were received with the introduction of the yeast to the recipe.

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Thus, Fig. 1 shows that after 1 h and 4 h of semi-finished products'deep frying, prepared according to a traditional recipe, was revealed a significant decline of the peroxide number in 2.8 and 1.75 times, respectively, while using the deep fat for 2 hours the content of peroxides increased 2 times compared to the initial value.

The phasic change of PV occurred in the deep fat test samples during its use, but with a 2 hours delay. It was noted that after 3 hours of deep frying there was revealed a crediblefall of peroxide value in 1.7 times, and using deep fat for 1 h and 3.5 hours PV increased 1.8 times relative to the initial value (Figure 1).

This is explained by the fact that organic acid, released during the fermentation of dough by yeast, acts as a synergist of antioxidants and thus contributes to a slower peroxidation of deep fat during its use [8, 9].

Decrease in peroxide values in 4 hours of deep frying suggests increase in the number of stronger oxidation products in the deep fat by that time. Oxidation processes occurring in deep fat were tested according to the content of stronger oxidation products–by the amount of diene conjugates and ketodienes.

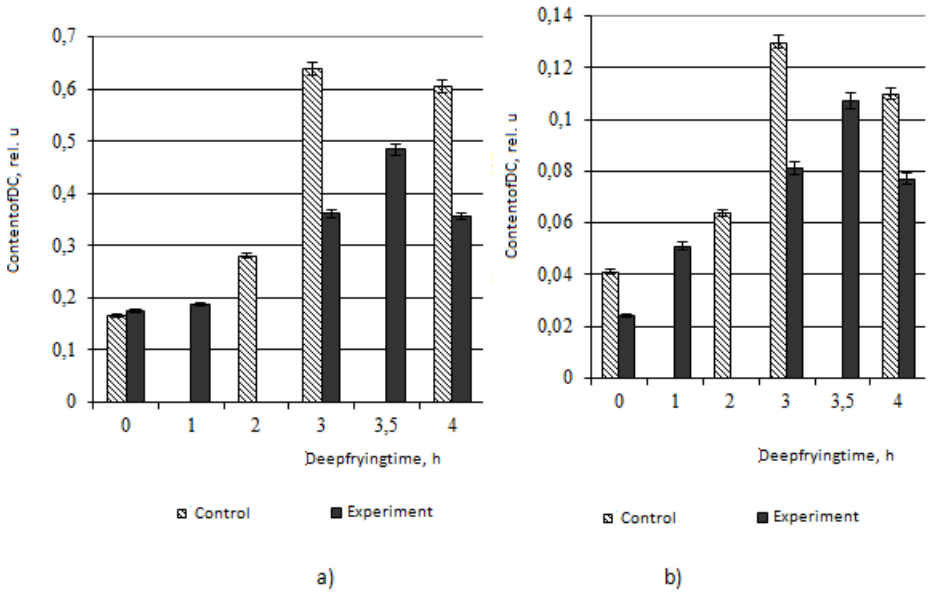

Figure 2 - Changes in the content of diene conjugates (a) and ketodienes (b) in the deep fat during its use

As appears from Fig. 2 (a, b), the content of DC and KD in the deep fat changed depending on the deep frying duration. It is important to note that the maximum content of DC in control and experimental samples was observed after use of deep fat for 3 h and 3.5 h respectively, and initial values of these indexes were almost equal (Fig. 2a).

The control samples analysisof the deep fat also showed that the initial content of KD (Fig. 2 b) was almost 2 times higher than that of deep fat experimental samples, in which were fried experimentalsemi-manufactures with the introduction of *S. cerevisiae* yeast to the recipe.

It should be noted that the maximum values of the intermediate products of lipid peroxidation content - diene conjugates and ketodienes in control and experimental samples of deep fat, were recorded after using deep fat for 3 and 3.5 hours, respectively. Time shift taking place in the formation of secondary oxidation products is characterized by a lower rate of the product oxidation process and a lower degree of deep fat lipids oxidation, where experimental semi-manufactured productswere fried with the introduction of the yeast to the recipe.

SUMMARY

Thus, the set of received results indicates that in the conditions of a four-hour frying deep fat undergoes changes, the severity of which depends on the composition of theexperimentalflour confectionery products. The processes of oxidative degradation of the deep fat, which was used for the frying of semi manufactures, made with the introduction of the yeast *S. cerevisiae* to the recipe, occur in later terms, as compared to the deep fat, which was used for the frying of experimentalsemi manufactures of the flour confectionery products, cooked according to a traditional recipe.

CONCLUSION

The obtained results allow appreciating the prospect of *S. cerevisiae* yeast application in the technology of making flour confectionery usingthe deep-fat frying method.

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