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THE EFFECT OF BIODEGRADABLE POLYMER PACKAGING ON THE QUALITY OF BAKERY PRODUCTS

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Abstract:

The paper shows the possibility of using biodegradable packaging based on polysaccharides (xanthan, carboxymethyl cellulose - CMC), as well as a biologically active additive (lecithin). In the study of organoleptic evaluation, it was noted that the developed package improves the organoleptic characteristics of the product, namely, the test samples had a more attractive appearance compared to the control samples. It was also found that the application of a film coating made it possible to save an average of 2% of the products. In the course of the experiments, it was noted that, in prototypes, during deformation (pressing) of the product surface, the form was restored faster than in the control sample. In the course of further research, it was found that all the packed samples of bakery products retained their original properties for a long period of storage (96 hours), which was confirmed by microbiological studies. Thus, the application of biofilm reduces the overall contamination of bakery products, thereby contributing to an increase in shelf life. During the preliminary economic calculations, it was found that the use of film coating cost-effective, because despite the minor additional costs for equipment and raw materials (1 - 2%), the storage time of the finished product increases by 24 hours.

Key words: *film coating, polysaccharides, xanthan, carboxymethylcellulose, lecithin, food products.*

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INTRODUCTION:

The quality and safety of food products is directly related to their protection against microbial contamination at all stages of production, processing, storage and sale. Among the basic principles of the formation of the quality of raw materials and food products are fundamental to their safety, environmental friendliness and long-term nutritional value [10]. Modern traditional polymeric materials provide a certain level of protection, but they cannot have a directional effect on biochemical and microbiological processes occurring in raw materials during storage [8].

Currently, one of the promising areas in addressing the global environmental problem associated with the pollution of the human environment with polymeric waste materials is the creation and use of environmentally friendly types of packaging and packaging. In this regard, worldwide, great attention is paid to the development of biocorrective (biodegradable) and edible packaging materials used together with food products that simplify the dosing and portioning of products that do not litter the environment [11].

Today, consumer demand for alternatives to using more environmentally friendly products is growing [8]. In this regard, the development in the field of creation and application of food coatings are relevant. The purpose of this work is to study the effect of biofilm coating on the quality of bakery products during their storage.

The objects of research were bakery products made from yeast dough.

MATERIAL AND METHODS:

Film coating prepared according to the Patent of the Russian Federation No. 2662008 [2].
The quality indicators of raw materials, semi-finished and finished products were evaluated according to GOST 5897-90; GOST 5667-65 [7].

Sample preparation of bakery products for testing carried out according to standard methods [7].
Microbiological studies were carried out according to generally accepted methods GOST R 50480-93, GOST 10444.2-94 [6].

Static processing of research results was carried out using the experiment planning methodology and the Microsoft Office Excel 2007, MathCad 14 application programs.

RESULTS AND DISCUSSION:

Bakery samples from yeast dough were baked according to standard recipes and technology, the initial weight of semi-finished products was 50 g [1]. Film coating was performed twice (before and after baking). According to the conducted organoleptic assessment, it was noticed that the developed package improves the organoleptic characteristics of the product, namely, the test samples had a more attractive appearance compared to control samples (Fig. 1). As can be seen from Figure 2, the average organoleptic evaluation of the test sample was 5.0 points, and the control one was 4.7 points.

a b

Figure 1: Appearance of bakery products: a- prototype; b - control sample

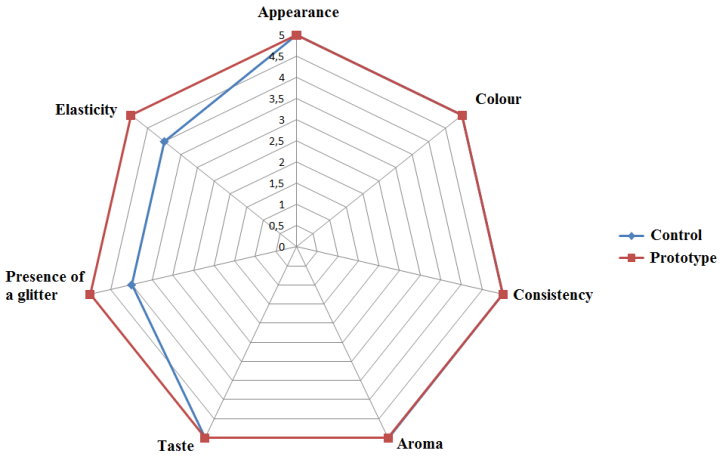

Figure 2: Profilogram of the studied samples of bakery products

In the process of further storage of experimental and control samples of bakery products at a temperature of 15-16 ° C, relative air humidity of 60%, air velocity of 0.1 m / s, it was found that film coating allowed to save an average of 2% of the mass of products (Figure 3).

We also noted that in prototypes, when the product surface was deformed (pressed), the form was restored faster by 1 second than in the control one (without film coating) [3].

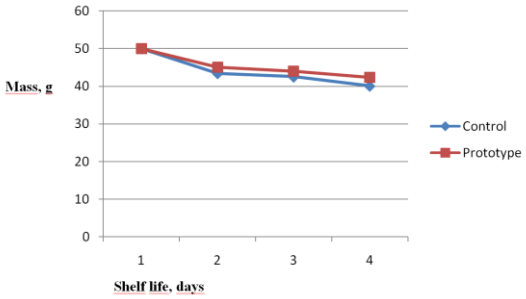

Figure 3: Loss of mass of bakery products during storage

In addition, in the course of research, we studied the methods of applying a film coating on prototypes: spraying, dipping, brushing and wrapping around the product. For bakery products, the last two above-mentioned methods of application turned out to be the most optimal. The method of applying with a brush was chosen due to the fact that it is possible to adjust the thickness of the applied film coating, as well as the formation of an appropriate gloss and improve the appearance of the product.

For wrapping experimental products, a biofilm thickness of 1.5 mm was experimentally selected. The film at a given thickness was obtained transparent with a yellowish tinge, flexible, durable. In addition, this method is also recommended for portioned (lumpy) food products in order to use them as the primary packaging [4].

In the course of further research with comparative sensory analysis, it was found that all the packed samples of bakery products retained their original properties for a long time (96 hours), which was confirmed by microbiological studies. While the recommended shelf life for bakery products is 72 hours, according to SanPiN 2.3.2.1324 -03 [5].

According to the data of Table 1, it can be seen that the presence of a biofilm reduces the overall contamination of bakery products, thereby contributing to an increase in shelf life. This is due to the fact that the developed package reduces the access of oxygen to the product and almost completely inhibits the growth of aerobic bacteria-causative agents of spoilage, as a result, the resistance of the product during storage increases [4].

Table 1: Microbiological indicators of test and control samples of bakery products during storage

Microbiological indicators	SanPin 2.3.2.1078-01	Control	Prototype
After 72 hours			
TBC (CFU / g)	$1x10^3$	-	-
Yeast / mold growth (CFU / g)	50	-	-
E. coli bacteria (CFU / g)	1,0	-	-
After 96 hours			
TBC (CFU / g)	-	$0,1x10^2$	-
Yeast / mold growth (CFU / g)	-	$0,2x10^2$	-
E. coli bacteria (CFU / g)	-	-	-

Note: (+) presence of bacteria, (-) absence of bacteria.

Thus, the analysis of experimental data led to the conclusion that the applied biocorrection film created on the basis of the bacterial polysaccharide has prospects for use in the food industry due to the extension of the shelf life of the food product, in particular the bakery product made from yeast dough, and the improvement of the mechanical parameters.
Preliminary economic calculations have shown the feasibility of using a film coating, since the additional costs for equipment and raw materials will average 1–2% of the total cost of raw materials and materials, but at the same time it must be taken into account that the shelf life of finished products will increase by 24 hours [9].

CONCLUSION:

The technology of packaging bakery products in biocorrecting film, created on the basis of bacterial polysaccharide, allows to obtain products with improved sensory properties and prolonged shelf life.

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