

## MATHEMATICAL MODELING OF THE PROCESS OF STORAGE OF THE MIXTURE FOR SOFT ICE CREAM OBTAINED USING ULTRASOUND

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To date, our countries have made great progress in ice cream production technology. Substantially expanded list of food raw materials used as components of this product. The assortment of ice cream also significantly increased. But the existing wide range of ice cream cannot completely satisfy the needs of consumers who constantly put forward new demands for ice cream – they want new flavors, flavors, new form, in addition, new demands on the calorie content of ice cream, its nutritional and biological value have appeared. Much attention is paid to the technology of making soft ice cream on the spot of sale. This technology is based on the production of a mixture of soft ice cream and the use of a freezer. At this time, there are several types of technologies for the preparation of the mixture for soft ice cream, but they have a significant drawback – a small shelf life, namely storage of the mixture for the production of soft ice cream of its own production is only possible at a temperature from 0 to +4 °C not more than 18 hours.

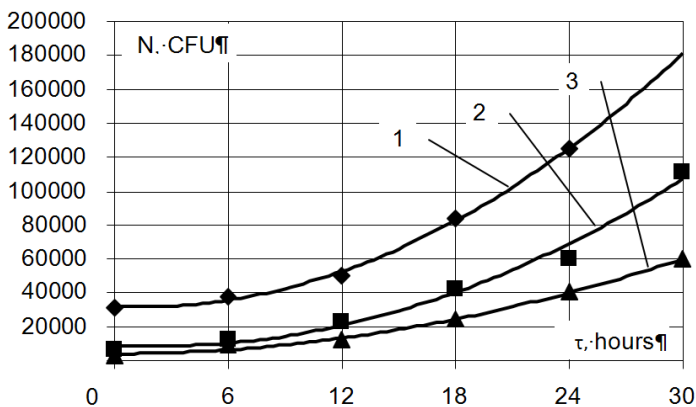
The known technologies of extending the storage time of these products are based on thermal treatment (pasteurization and sterilization), the use of ultrafiltration, additives to the product of different nature by chemical preservatives. At the same time, the nutritional and organoleptic properties of liquid food products deteriorate significantly as a result of denaturation of proteins, destruction of the enzyme-vitamin complex. A promising direction for increasing the shelf life of these products is the use of electrophysical methods for their processing. In order to develop new technologies for increasing the shelf life of a mixture of soft ice cream by electrophysical methods, it is necessary to carry out comprehensive studies of physicochemical and microbiological parameters.

The main advantages of the technologies developed on the basis of the influence of the ultrasound field are the complete preservation of food and taste properties of the products, the versatility that allows them to be used in various technological processes; profitability – thanks to the use of

pulsed technologies; environmental friendliness – by eliminating the use of heat and chemical preservatives; the possibility of complete automation of technological processes.

Three samples of a mixture of soft ice cream were made for the experiment. The first sample of the mixture for soft ice cream is standard technology (sample 1), a second sample of a mixture of soft ice cream – using ultrasound for 10 minutes (sample 2), a third sample of a mixture of soft ice cream – using ultrasound treatment for 20 minutes (sample 3).

The resulting samples of the mixture were to be stored in a refrigerating chamber at a temperature of 3 °C. Every 6 hours, samples were taken for the microbiological analyzes of the specimens. According to permissible bacteriological indicators, the number of microbes in 1 ml of the mixture should not exceed 100 thousand colony forming units (CFU). According to the results of the study, it was found that in sample 1 after 20 hours of storage of CFU exceeded the permissible limits, in sample 2 the increase of the permissible limit of CFU was detected after 30 hours of storage, sample 3 after 30 years of storage had a CU of 40–45% less than the maximum permissible values. Organoleptic metrics for sample 3 met the requirements. The results of experimental studies are shown in Figure 1.



**Fig. 1. Dependence of the amount of CSFs in a mixture of soft ice cream depending on storage duration: 1 – control sample (sample 1); 2 – sample that was processed by ultrasound for 10 minutes (sample 2); 3 – sample, which was processed ultrasound for 20 minutes**

Thus, according to the results of the research, it was found that ultrasonic treatment of the mixture for soft ice cream can increase the storage life by 38–66%.