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INNOVATIVE TECHNOLOGY OF COTTAGE CHEESE DESSERT "ENERGY" USING FOOD ADDITIVE MAGNETOFOOD

Abstract. The results of the influence of “Magnetofood” food additive on the quality indicators of cottage cheese dessert (organoleptic characteristics, density, mechanical strength, effective viscosity, degree of overrun and volume kinetics during storage) are presented. It was found that the introduction of “Magnetofood” additives in the experimental samples of curd dessert in the amount of 0,1%; 0,15; 0,2% by weight of the recipe mixture in comparison with the control improves the structure, texture and appearance of the finished product. The rational content of “Magnetofood” in the curd dessert recipes was determined – 0,15% by weight of the recipe mixture. The prospects of using “Magnetofood” as an improver and stabilizer of polyphase foam-like structures are determined.

Key words: curd dessert, “Magnetofood” food supplement, quality indicators.

Introduction. To date, such objective technological properties inherent in sour milk cheese as the main raw material have not been solved, namely protein clot compaction, syneresis, low moisture holding capacity, – which make a significant contribution to the quality indicators of dairy products.

The use of food nanoparticles in the technology of fermented milk curd products is a new and promising area of research. The problem of improving the functional and technological properties of fermented milk cottage cheese as the main raw material for fermented milk products and the formation of the quality of finished products is solved by using the “Magnetofood” mineral nanoadditive (based on ferrous and ferric iron: $\text{FeO} \cdot \text{Fe}_2\text{O}_3$). “Magnetofood” is a fine powder of dark brown or black color with a particle size of 70...80 nm, with a large specific surface; antioxidant, bacteriostatic, sorption, complexforming, structuralforming, stabilizing, emulsifying, water- and fatretention properties.

Materials and methods. The subject of the study is model curd masses with a mass fraction of the “Magnetofood” food additive 0,10%; 0,15%; 0,20% by weight of the recipe mixture. The “Magnetofood” food additive (FAM) was introduced in the form of: 1) a fat suspension with stirring cottage cheese in an amount of 0,2 g; 0,3 g; 0,4 g per 100 g of the prescription mixture, which is 0% (control – sample 1); 0,10% (sample 2); 0,15% (sample 3); 0,20% (sample 4) FAM.

To determine the organoleptic (on a 5-point scale taking into account the weight coefficients of each indicator), physical and chemical (total acidity, mass fraction of moisture, density), structural-mechanical (effective viscosity using a Reotest-2 rotational viscometer, mechanical strength and ultimate shear stress – on the AP-4/1 penetrometer, microstructure of the knocked-down mass using a microscope) indicators, generally accepted and standard methods were used.

Results and discussion. To achieve the goal, the following tasks were solved: study the influence of the “Magnetofood” food additive (FAM) on the organoleptic characteristics of prototypes of cottage cheese dessert; microstructure and distribution of air bubbles by diameter, physicochemical and structural-mechanical indicators of prototypes of whipped curd masses. The surface activity of “Magnetofood” nanoparticles and their ability to form solvate complexes with protein molecules improves the consistency of cottage cheese dessert, which can be seen from organoleptic indicators (Fig. 1).

It was found (Fig. 1) that the best appearance and consistency was characterized by a dessert with a mass fraction of food additive "Magnetofood" (FAM) 0,15% by weight of the recipe mixture. Therefore, the rational content of FAM was 0,15%.

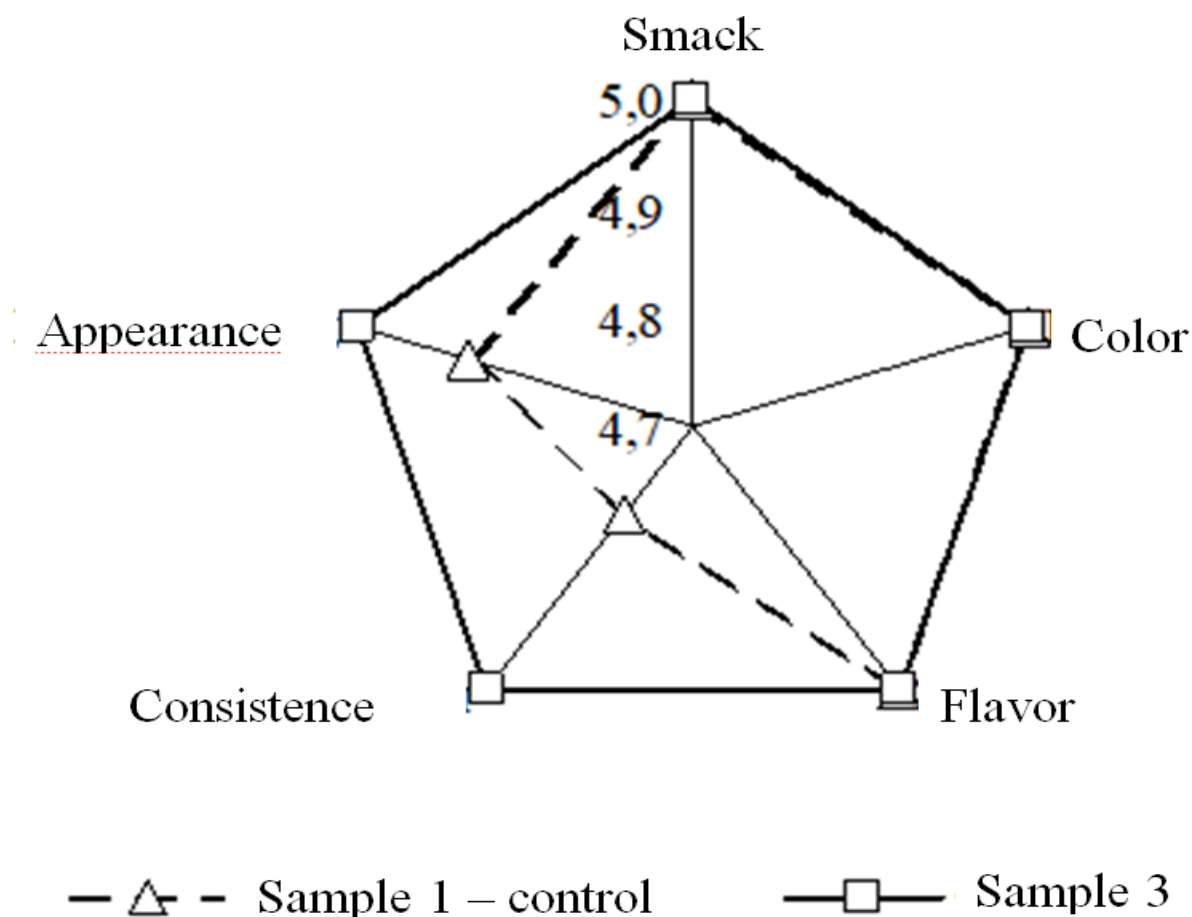


Fig. 1. Organoleptic characteristics of experimental samples of cottage cheese dessert with 0,15% FAM (sample 3) compared with the control (sample 1)

The introduction of the "Magnetofood" food additive (FAM) into the curd dessert recipe ensures sufficient stability of the product, as can be seen from the narrow curve of the distribution of diameters of air bubbles (Fig.2).

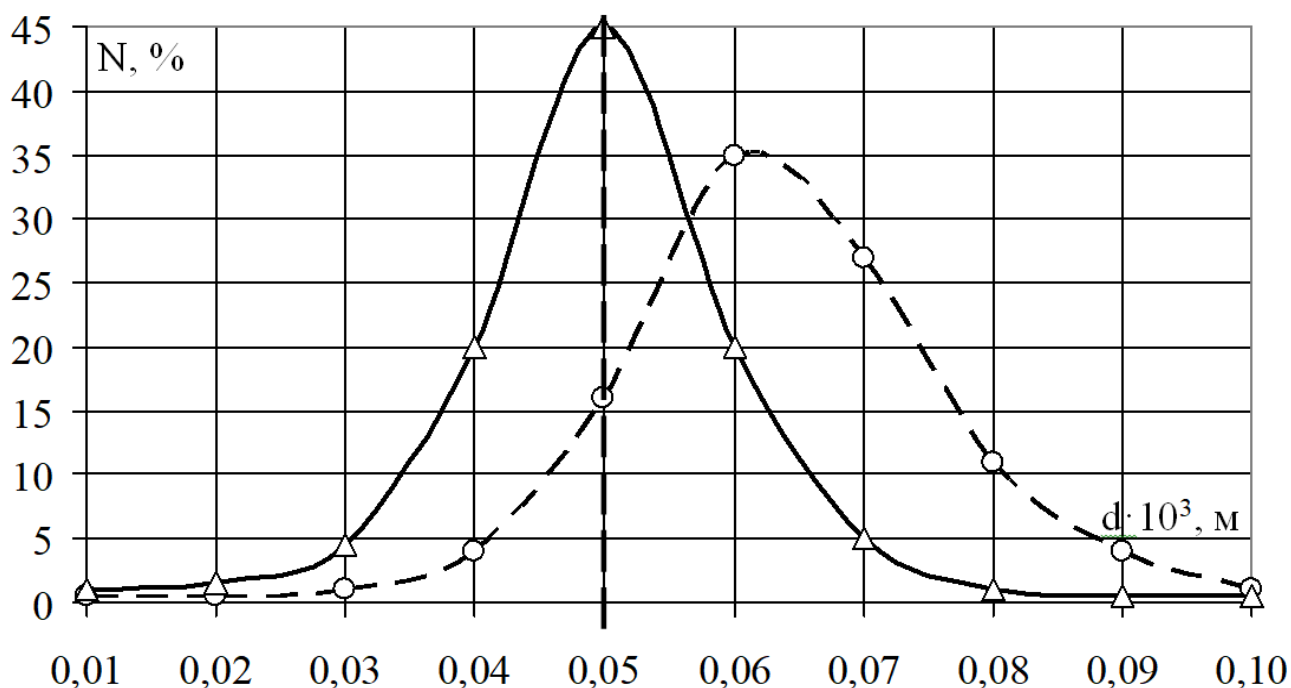


Fig. 2. The distribution of air bubbles by diameter in the experimental samples of cottage cheese dessert: —○— – control, —△— – dessert "Fantasy" with 0,15% FAM

A narrow distribution of air bubbles in diameter, helps to stabilize the foam structure of the curd dessert. This is explained by the compelling properties of FAM Fe atoms and the formation of coordination and electrostatic bonds of "Magnetofood" nanoparticles (NPM) with cottage cheese proteins, which strengthens the foamy structure of the curd dessert (contributing to the foaming and fixing of air bubbles in the system).

In addition, the introduction of FAM corrects the structural and mechanical characteristics of the curd dessert: with an increase in the mass fraction of FAM, the maximum shear stress is 1,18...1,3 times (which characterizes the bond strength in associative complexes of a polyphase structure with NPM having structure-forming ability), the thixotropy coefficient is 1,26 times compared with the control.

As a result, the stability of the curd product increases and its structure softens somewhat (due to the fat-binding of NPM and the formation of a structured-solvated system) (Fig. 3).

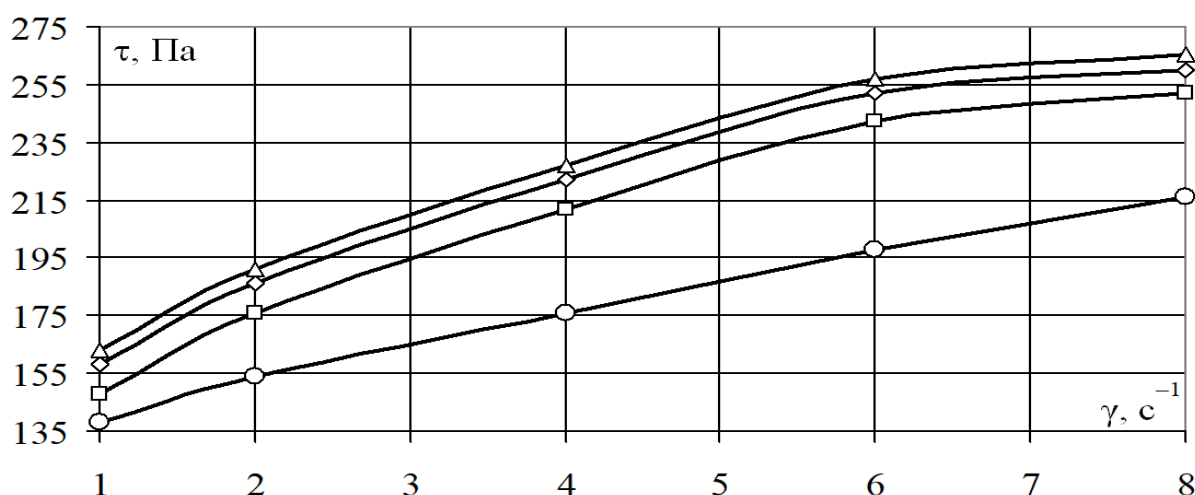


Fig. 3. The shear stress of the prototypes of cottage cheese dessert: – control, – 0,1% FAM, – 0,15% FAM, – 0,2% FAM

At the same time, the structural and mechanical parameters of the dessert remain stable throughout the entire shelf life (24 hours).

Thus, the introduction of FAM in the amount of 0,10%; 0,15%; 0,20% functionally affects the structural and mechanical characteristics of the dessert from sour milk cheese: with increasing mass fraction of HDM increase: the maximum shear stress of 1.18...1,3 times (also, the slope of the dependence $\tau = f(\gamma)$ is greater relative to the control sample) and thixotropy coefficient of 1,24...1,28 times compared with the control. It is established that this nature of the effect has a positive effect on the texture of the product.

That is, functionally FAM corrects the structural and mechanical properties of sour milk cheese products and slightly softens the structure of the dessert (due to water and fat retention), but does not change the stability of the dessert throughout the shelf life of the product, because the viscosity of cheese desserts within 24 hours of storage did not change.

Thus, the introduction of FAM improves organoleptic characteristics, stabilizes the foamy structure of the curd dessert, including during storage; contributes to the formation of stable forms of the product.

The rational parameters of the technological process for the preparation of cottage cheese dessert were determined: mixing ($n=2,0...2,2 \text{ s}^{-1}$) 50% sour cream with a fat suspension of FAM for $(3...4) \times 60 \text{ s}$, holding sour cream-fat-magnetofood mixture $\square=(27...30) \times 60 \text{ s}$ followed by whipping the mixture ($n=5,8...6,0 \text{ s}^{-1}$) for $(8...10) \times 60 \text{ s}$ and mixing ($n=2,0...2,2 \text{ s}^{-1}$) with cottage cheese and whipped with powdered sugar sour cream for $(3...5) \times 60 \text{ s}$.

Based on the studies, a recipe was compiled and a technological scheme of the cottage cheese dessert "Fantasy" with FAM was developed.

Conclusions. It is determined that the introduction of FAM (as a fat suspension) in the amount of 0,15% by weight of the prescription mixture improves the organoleptic properties, stabilizes the foamy structure of the cheese dessert, including during storage.