FORMATION OF A CELLULAR CRYSTAL SUB-MICROSTRUCTURE IN BUTTER WITH ADMIXTURES
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The ecological situation of the interest of all countries in manufacture of products with admixtures natural raw materials. We have developed new types of butter with admixtures of vegetable raw materials possessing an extremely plastic consistency. The influence of red-beet cryopowder admixtures (obtained by sublimation drying) on formation of the sub-microstructure of the milk fat phase has been studied by the electron microscopy method. A cellular crystal structure was found to be formed in the butter on the fat globules surface as well as in the interglobule sphere. The size of cells is around 100 nm. The mechanism of the structure formation has also been studied. In the processes of the milk fat phase crystallization water-soluble beet components play the role of admixtures enriching the boundary layer of the fat component crystallization interface. It conduces to morphological changes of fat and water phase separation surface which has clearly been fixed on the electron microscopic photographs. Knobs with the average diameter of around 60 nm are the initial stage of the cellular structures formation of which the cellular structure is formed thereafter. Interaction of the fat and water phases in the processes of the structure formation has been found. The knobs are formed of the most high-melting fat glycerides and are surrounded by concentric rings of ultradisperse water particles with the size of 3 to 12 nm. During the milk-fat hardening process the most low-melting glycerides along with moisture are rejected by the moving crystallization interface to the cells boundaries. The ultradisperse water particles tend to occupy a stable thermodynamic position and are arranged on vertices and faces of four-, five- or six-angle fat crystals with octahedral, decahedral and icosahedral forms. The plastic consistency of the butter is explained by the cellular sub-microstructure formation.