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NANOSTRUCTURE AND BUTTER FUNCTIONAL PROPERTIES WITH ADDITIVES OF VEGETABLE POWDERS

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ABSTRACT

Vital task of present-day food industry is the development of nutrition with functional properties. Such food plays a huge role in health maintenance and diseases prevention. To make traditional food have functional properties use bioactive compounds. In recent years, great attention is paid to plant raw materials. We developed technology and assortment of butter with freeze and cold spray drying powders of red beet, blackcurrant buds, and carrot. Powders have a large number of functional properties and reconcilability with butter. An integrated exploration showed powder additive has a multi-functional action on butter: increase its organoleptic evaluation, indicators of the structure and consistency, storage ability, retard microbiological and oxidative processes of butter spoilage. We first studied butter nanostructure using scanning electron microscope. It has been found butter is nanocrystall heterogeneous system. The powder additives have a great impact on nanostructure formation of butter. Nanostructure elements decrease by 5-25 times with sizes in nanometr range (1-100nm). The nature and properties of powders have a great impact on morphology, architecture and nanoelement structure. Cellular nanostructure is formed in butter with red beet additive (mesh size of 60-100 nm). The mechanism of its formation was proposed. Its beginning is heterogeneous nucleation of aqueous nanodrops and nanoknolls. Crystalline aggregates and surface membranes are formed from rounded and tabular nanocrystals in butter with black current additives. For the first time it has been revealed the nanostructure impact on retard of microbiological and oxidative processes. It has been proposed complex mechanism of oxidation activity inhibition in butter fat phase. It is caused by antioxidative properties of powder supplements and butter nanostructure: absorption and emission processes of powder compounds on internal free surface of fat phase nanopores, which have made complication for oxygen access and increased butter oxidation resistance. It has been proposed a nanoelement classification of butter nanostructure. According to the results of biomedical testing and Public Health Ministry conclusions the developed butter is recommended to use in dietary and prophylactic nutrition. Developed scientific basis of nanostructure formation of functional butter with vegetable powders is used for butter nanostructure and physical and chemical properties regulation, and also for butter nanotechnology creation with the desired properties.

KEY WORDS

Nanostructure, butter, vegetable powders, nanotechnology, functional properties.

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