THE RED BEETS' CRYO POWDER ADDITIVE'S EFFECT ON THE NANOSTRUCTURE AND QUALITY OF BUTTER

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Background: One of the main problems of the modern food industry is to create foods that meet modern requirements of a balanced and healthy nutrition. Food must not only satisfy human needs of essential nutrients, but also should have healthy, prevention and treatment functional properties. The most common way of nutrition correction in many countries is food enrichment. Nowadays scientists pay much attention to plant supplements. The butter with red beets' cryo powder was developed in our university. The cryo powder contains a wide range of carbohydrates, pectin, cellulose, organic acids, protein, and microelements (K, Ca, Na, Mg, P, Fe, Zn, Cu, Mn, S), vitamins (A, B_2, B_6, P, C , E, D, H), polyphenols compounds of P-vitamin activity. It is rich in valuable biologically active substance betaine that refers to the B vitamins, and contains 8 carotenoid among which ksantofil predominates. Disintegrator crushing of cryo powder to 10-75% increases the content of free biocomponents: amino acids, including essential ascorbic and dehydroascorbic acids, phenolic compounds, organic acids, aromatics, etc. Nowadays, scientists associate the establishment of functional food with nanotechnology, which is based on ability to create a nanostructure objects, materials and systems with desired properties.

Objective: The studying of the butter's nanostructure with red beet's cryo powder and its influence on product's quality.

Methods: Micro- and nanostructure of butter was examined by scanning electron microscopy using chilling-breaks technique for the preparation of samples. Indicators of structure and texture were studied by conventional methods. The butter samples with red beet's cryo powder: just prepared (MBsv) and samples, stored at - 18 ° C for six months (MB_{-18}) were investigated.

Results: In MB_{SV} samples the emulsion layer of inter globulyar area, where the fat globules and multifaceted crystal are aggregate are immersed in were noticed. On their surface there are visible kagalnye elements of nanostructure: nanoparticles of aqueous phase and their dimensional chains and bumps (d ~ 60-100 nm). The structure of nanobumps consists of glycerides' nanograins (d ~ 3-6 nm) and contains concentric layers of water nanodroplets (d ~ 3-12 nm). They appear heterogeneously on the rough interphase interfaces. In the MB_{18} samples there is a numerous cellular nanostructure with mesh sizes up to 100 nm on the surface of the fat globules and crystalline elements. The electron microscopy indicates the hierarchical formation of cellular nanostructures. The mechanism of cellular nanostructures of MB samples, based on its nanostructure self-organization, phase transitions and the effects of components of cryo powder was proposed. The nanoelements' structure shredding of butter with the red beets' cryo powder improves the structure and texture of butter: it decreases the hardness of butter, improves its flexibility and ability to hold the liquid phase of fat, increased thermal stability, coherence, structure, inhibited both microbiological and oxidative deterioration of butter, which improves the butter's functional properties. According to the results of biomedical tests and conclusions of the Ministry of Health of Ukraine butter with red beet's cryo powder is recommended to use in health care and dietary nutrition.

Conclusion: It was established that the addition of a small amount of red beet cryo powder helps to reduce the elements in the nanoscopic range. The mechanism of butter's cellular nanostructures' forming was

proposed. The research results can serve as a theoretical basis for the creation of nanotechnology functional types of butter and other food