D45

NEW APPROACHES TO EMULSIVE PRODUCTS FOR THE MEAT INDUSTRY

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By the development of emulsive food products diverse problems arise which are connected with providing their stability to coalescence, aggregation and flotation, demanded consistency and acceptable organoleptic properties. The approach which is widely used in the modern food industry consists in the selection of low-molecular mass surfactants as emulsifiers. This approach, however, is lacking in versatility and needs the use of a number of non-conventional food ingredients. Accepting the effectivity of this aproach, we, however, efforted to develop an alternative approach based on the utilization of functional properties of food biopolymers - proteins and polysaccharides.

Preparations of food proteins rank below many low-molecular mass surfactants in emulsifying capacity. However, the technological praxis evidences for the possibility of the production stable emulsive foods by the use of rather high concentrations of food proteins with good emulsive properties, such as caseinates or milk serum proteins. An additional effect can be attained by the use of anionic polysaccharides, such as alginates or low-methoxylated pectins, as ingredients of emulsive products. These substances, being surface active, can enhance the strength of the protective layer on the surface of oil droplets due to the formation of either unsoluble calcium salts or soluble and unsoluble complexes with proteins.

Usually complexes of proteins with anionic polysaccharides are obtained at pH values which are lower than the isoelectric point of the protein, as a rule laying in weak acidic media. In this case complex formation results from the interactions between oppositely charged macromolecules of a protein and a polysaccharide. We name these complexes coulombic ones. Coulombic complexes by theirselves are unstable at high ionic strengths which are typical of many foods. However, these complexes can be stabilized through short-range interactions, such as Van der Vaals' interactions, hydrophobic interactions and hydrogen bonds which develop after the mutual approach of interacting macromolecules.

In the Institute of Food Substances, Academy of Sciences of Russia, experimental data are obtained which evidence for the possibility of the formation of protein-polysaccharide complexes at pH values higher than the isoelectric point of the protein ("non-coulombic complexes"). Such complexes are formed mainly due to hydrogen bonds, hydrophobic interactions as well as entropic interactions resulted from the desolvation of functional groups. Non-coulombic complexes as a rule are stable at high ionic strengths, and their use can substantially extend the scope of methods of production stable emulsions. It seems also promising the use of complexes of low molecular mass surfactants with polysaccharides as stabilizers of food emulsions.

The method of the stabilization of emulsions through the formation at the interface of a protective layer of calcium alginate or pectinate is highly versatile. It allows to compensate the insufficient stabilizing action of a protein, in particular at its relatively low content.

The formation of a gel network of calcium alginate or pectinate in the the aqueous

phase allows to increase stability of emulsions to flotation (kinetic stability) as well as to provide the demanded consistency of a product through the regulation of rheological properties of its aqueous phase. Along with changes of structural mechanical properties of the dispersion medium, consistency (structural viscosity) of concentrated emulsions can be controlled through the strengthening or weakening of contacts between dispersed particles. It is shown, in particular, that concentrated emulsions stabilized by soybean protein isolate are thixotropic, this property being practically uneffected by the addition of a low-methoxylated pectin and a calcium salt. Thus, thixotropic behavior of emulsions studied is caused by the structural framework formed by dispersed particles.

As an example there are described emulsions whose main components are the albumin fraction of soybean protein and lipids of soybeans. These emulsions are stabilised by sugar beet pectin. The viscosity of emulsions increases by the increase both in the fraction of oil phase and the concentration of pectin.Emulsions which contain abt. 3% w/w of the pectin and abt. 20% v/v of the oil are characterized by pronounced thixotropic behavior.

Emulsions containing abt. 15% of the protein, abt. 3% of the pectin and abt. 20% of the oil are close both by composition and viscosity ($0.6.10^4$ Pa.s) to the paste mass. This allows to use the emulsions in the production of combined paste masses with the conventional equipment. The growth of the emulsion content in the paste mass results in the increase in its water- and fat-binding capacities. The thermal treatment leads to decrease of the plasticity but practically does not effect the water- and fat-binding capacities.

The use of statisical models allowed to determine optimal recipes of meat pastes. It is found, in particular, that by the replacement of 24.5% of meat and fat by the emulsion high-quality meat pastes are produced. These pastes have prophylactic and medicinal action due to the presence of soybean proteins and lipids.