

DEVELOPMENT AND APPLICATION OF DIETARY FIBERS AND SOY PROTEIN COMPLEX IN MEAT PRODUCTS TECHNOLOGY

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Abstract – a complex of proteins and polysaccharide for meat product technologies has been elaborated. It comprises «Maysol» soy protein isolate and «Vitacel» wheat cellulose of «J. Rettenmaier & Soehne» GmbH. The characteristics of properties of «Maysol» are connected with the substance of admixtures of polysaccharide nature as well as amino-acid make-up and protein denaturation level. We have examined properties of products of «Vitacel» line – the source of cellulose as a potential ingredient in a make-up of protein and polysaccharide complex. Functional and technological properties, solubility, swelling ability of products of «Vitacel» wheat cellulose and soy proteins have been generalized and researched. It was experimentally proved that the complex of proteins and cellulose sorbs spices aroma that are used in meat products recipes.

Key words – a complex of proteins and polysaccharides.

We demonstrated by experimental research that the functionality level of meat systems can be increased and stabilized by creating of a complex of «Maysol» soy protein isolate and «Vitacel» WF 200R wheat cellulose («J. Rettenmaier & Soehne» GmbH). These components are selected as a compound part of the complex, thanks to the highest functional properties in their class. The researched samples have biological activity, in other words they are physiological for biotest. Water retaining ability of the elaborated complex - 1: 8. The process of swelling of the complex is described with the kinetic equations by us. Water connects with cellulose in a chemical way as well as in copular and osmotic way. As for connection with soy proteins – it connects in a chemical way depending on the substance of free amino and carboxylic groups in the complex structure.

Rational limits of injection of the complex into meat systems are established - 2 – 4 % in

correlation with minced meat mass. It is proved that injection of the complex in terms of rational limits doesn't affect minced meat coloring and doesn't need additional correction. In terms of the stated above, under 4% of injection of the elaborated complex the total declination of color - 1.53 that is a permissible level.

With the help of «electronic nose» (Y.I. Korenman, T.A. Kuchmenko, 2002) by the method of piezoelectric microweighing it was demonstrated that the elaborated complex sorbs aroma of the spices and kitchen herbs, that identify smell and taste of the final meat products. In these terms the meat products structure improves as well as organoleptic properties of the final products improve. Application of the complex in meat products provides aroma persistency by 18% higher than the one of the control sample during a 72 – hour period. There have been researches of sorption activity of biopolymers of the products. It was experimentally proved that the complex consisting of «Maysol» soy protein and wheat cellulose of «Vitacel» can sorb spices aroma that are used in sausages production and in this way improve not only the structure of products but stabilize organoleptic indicators of meat products. Under the research of sorption activity of biopolymers of the product of «Vitacel» cellulose it was proved that it sorbs metal ions totally that is essential for the preventive measures of metal poisoning. More over, the elaborated complex used in recipes of meat products pulls out heavy metals out of human body.

In the process of experimental research it was demonstrated that functionality level of meat systems can be increased and stabilized by creation

of biopolymer complex of different chemical nature.

Our research results show that swelling of the researched complex increases in samples where the substance of «Vitacel» wheat cellulose is higher. This can be explained precisely with the fact that water connects with cellulose in a chemical way as well as through copular and osmotic way; in a protein – connection happens in a chemical way, and depending on substance of free amino and carboxylic groups in its structure.

Under identification of water binding ability s there were prepared a row of suspensions from initial suspension with an interval of 2,0 gr. of water per 1 gr. of the product: 1:4; 1:6; 1:8 и 1:10. The suspensions were mixed very thoroughly and water binding ability was identified. For the term of water binding ability there was taken a maximum quantity of water being added, where there is no observation of water phase separation in the process of the test in recalculation per 1 gr. of the product. Water binding ability was expressed in grams of water per 1 gr. of the product. The graphic scheme is presented in figure 1 and figure 2 .

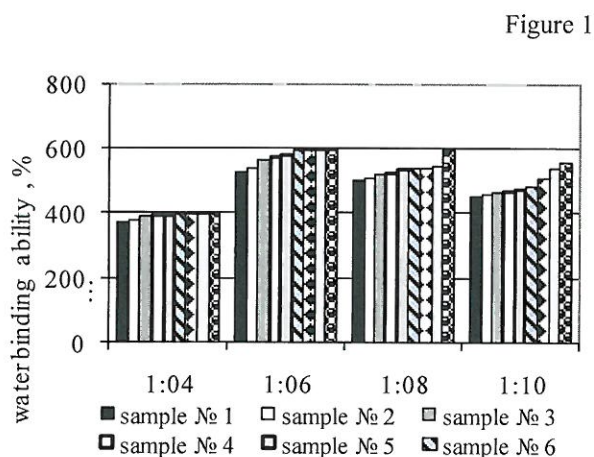


Figure 1 Water binding ability changing of the protein and carbohydrate complex in a different component ratio

The data in comparison shows us that water binding ability of protein and carbohydrate complex of «Maysol-Vitacel» has highest indications in a ratio of 4:6 under the hydration level of 1:6 and in

a ratio of 1:9 under hydration level of 1: 8. The analyses of experimental data on emulsifying ability identification (fig.2) indicated that the highest indications are reached in a ratio of 1:1, 2:3, 1:4 under hydration level 1:4

Figure 2

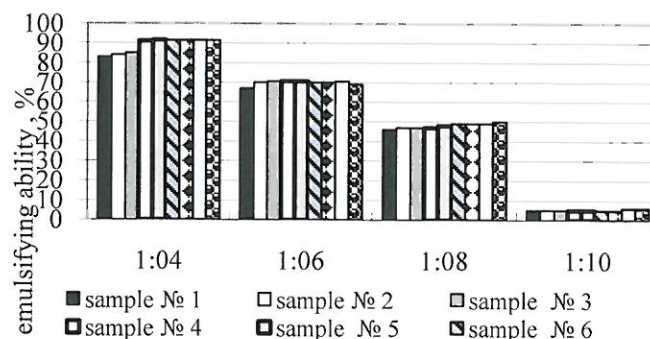


Figure 2. Emulsifying ability changing of the complex in different components ratio

As we can see in the diagram, along with complex hydration level increasing, emulsifying ability decreases. This is connected with hydration level of soy protein of «Maysol» series (1:5-6) and wheat cellulose of «Vitacel» (1:6-7).

The emulsion persistence is characterized with the quantity of bound moisture and fat. Under such like hydration the complex of proteins and carbohydrates has a surface for binding of hydrophobic sectors of lipid molecules and under a higher hydration many-layer hydrated covering is formed that blocks connection with them due to the saturation of water in the surface. The indicated properties of the complex in minced meat is well correlated with microstructure analyses data of the corresponding samples.

Classical scene of autolytic changes is observed in control samples of the minced meat as well as space dispersion of particles of muscle tissue in the minced meat.

Particles of muscle tissue of different size is well observed, space between pieces is filled with evenly painted homogeneous mass. All changes as a whole are related to autolytic processes, that touch upon the structure of the examined tissue to some extent.

A whole, muscle tissue particles were composed of longitudinal and many-direction muscle tissue bundles that are loosely located to each other. Friable connective stroma was observed on separate areas of slice/cut-off and besides that fat tissue inclusions as well. Almost contents-free space was found between tissue fragments that indicates on loose structure of the examined samples.

The minced meat structure containing complex of «Vitacel» WF 200 R plus soy isolate of «Maysol» differed essentially from the control samples of the minced meat.

Loose connective tissue-stroma and fat tissue inclusion were found in separate areas of the examined slice. Fibers of «Vitacel» WF 200 were found in between muscle tissue that formed a peculiar space structure, that filled evenly space between muscle tissue particles and it was a basis that kept meat particles in a static state.

As a result, microstructural characteristic of standardized meal section with the complex using proves that effect of stabilization of meat basis is reached at the expense of emulsifying and gelling, the level of which is reached and supported with correlation/ratio of protein and polysaccharide in the complex. As a whole, the microstructure analyses data confirms functional properties of the complex in meat systems as a stabilizing agent and gelling agent that proves its multifunctional properties.

The indicated characteristics of complex properties depending on biopolymers and hydration level ratio are put as a subject of future research. More than 30 recipes has been elaborated with using of soy isolate complex and wheat cellulose of «Vitacel» in production of cooked sausages, small sausages, and ham products, half-part smoked and cooked -smoked sausages and pastries.

The results of experimental research were approved and introduced into meat products manufacturing by many Russian factories with a real economic effect.

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