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The Study of Molecular Structure of Chitosan and the Determination of the Possibility of its use in Meat Production.

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ABSTRACT

By means of methods of computer chemistry possibility with chitozan in technology of meat products is investigated. Functional and properties of modeling systems with products of processing of chitin are studied. It is established, that chitin derivatives improve qualitative characteristics of modeling systems.
Keywords: chitosan, computer chemistry, polyamine, sausage, food.

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INTRODUCTION

There is a lot of information, and use accumulated experience in various sectors of the food industry, the howling of natural polysaccharides. Representative – emulsifier gelling agent and chitosan.

Chitosan forms a gel more fluid and more stable than other non-starch polysaccharides. The undeniable advantage is that chitosan is non-toxic, ecological clean, harmless to humans and the environment can be used for a long time in all areas of its use in the wild completely disintegrates.

The most important uses of chitosan worldwide recognized medicine and food industry. It is known that chitosan promotes peristalsis, reduce the pressure in the intestine and absorption of food by the body of harmful components, prevents the occurrence of colon cancer, revitalizes lymphatic cells capable of destroying cells affected by cancer. Chitosan is used to treat wounds, burns, ulcers; manufacture of surgical sutures, artificial skin, dosage forms antisclerotic, anticoagulant and antiartroznogo action. Unique D results indicates how enterosorbent chitosan. It absorbs fat and cholesterol in the food-nary tract. The positively charged chitosan is attracted to the negatively-dawn zhennomu fat, removes from the body fat of 10-12 times its molecular weight [1]. The chitosan to used in the food industry as an emulsifier, thickener and structuring agent for foods diet that promotes the removal of radionuclides from the body.

Chitosan is a natural cationic Polyamin. This structure rarely meets amongst natural substances and is unique among polysaccharides. The chemical structure of chitosan is a β-(1-4)-2-amino-2-deoxy-D-likepolished.

METHODS

Molecular properties a fragment of the molecules of chitosan was study to use HyperChem (Fig. 1) [2, 3]. At low pH values (<6,3) amino group protonation and chitosan is a cationic water-soluble polyelectrolyte. In the acidic environment of the chitosan, dezazetilirovanie 75% or more, dissolve quickly, forming transparent, homogeneous and viscous solutions. A sufficiently high thermal stability of solutions of chitosan can used in sausage production. At low pH values (<6,3) amino group protonation and chitosan is a cationic water-soluble polyelectrolyte. In the acidic environment of the chitosans, dezazetilirovanie 75% or more, dissolve quickly, forming transparent, homogeneous and viscous solutions. A sufficiently high thermal stability of solutions of chitosan can used in sausage production.

MAIN PART

The simulation results (Fig.1) indicate that the highest density of negative electrostatic potential is concentrated in the area of nitrogen atoms. This makes the possibility of addition of the proton to the nitrogen atom in an environment with low active acidity. Based on this property the ability of chitosan to be dissolved in organic acids to produce colloidal solutions and their use for the production of food in order to make them relevant organoleptic technical, rheological and physical characteristics.

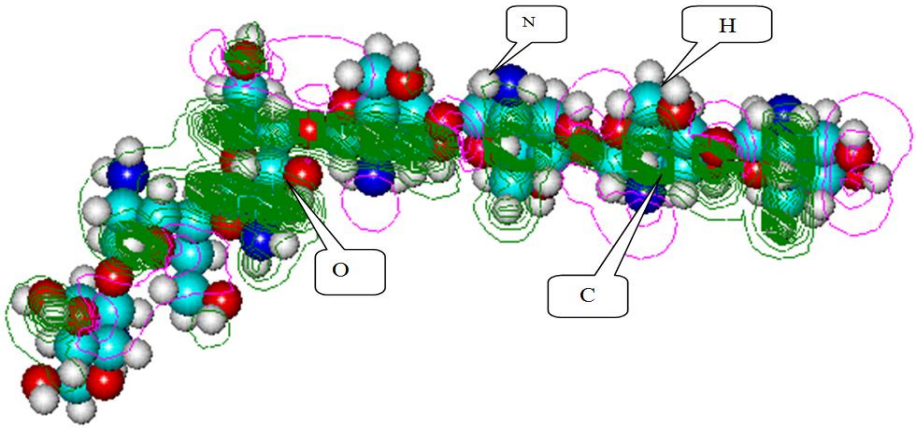

Figure 1: Fragment of the molecular structure of chitosan

At the faculty of biotechnology, North Caucasus State Technical University was established the possibility of using as a solvent of chitosan for obtaining colloidal solution. The use of whey as a solvent of chitosan has many advantages; it is a natural product and are always available on dairy enterprises. Whey in its composition, nutritional and biological values is a valuable raw material from which it is possible to produce a wide range of food products. Upon dissolution of chitosan in serum organic acid capable of giving a proton to the nitrogen atom of chitosan. In the area of high electron density in the first instance may be directed attack of the electrophilic reagent, as well as areas with low electron density, which could be attack of nucleophilic reagents. Chitosan has two important properties: dissolve in an acidic environment and the ability to bind to surface molecules bearing a negative charge. On the other hand, the acetylated amino group of chitosan has no charge and is responsible for hydrophobic interactions. Therefore, chitosan and its derivatives to use as a natural gelling agent and emulsifier. On the surface electron density distribution of the molecule of chitosan observed in plots without charge. These molecules were the primary hydrophobic and oriented towards non-polar molecules. The presence of these areas of evidence have confirmed the ability of the molecule to form the emulsion.

When pH value is above 7, the amino group deprotonation, chitosan is insoluble in water. However, in this range of pH the amino group exhibits nucleophilic properties, and the lone pair makes the possibility of Association with oppositely charged groups of a number of compounds. On this property of chitosan based obtaining water-soluble (at pH above 7) derivatives of chitosan.

SPECULATION

Found that 3-4% chitosan solution in the whey will not have a material impact on the value of the active acidity of the meat-minced systems, and the availability of whey proteins will enhance the nutritional value of the finished products. Based on obtained results to conclude that in further studies for the dissolution of chitosan it is advisable to use the whey with a pH of 4.5 to 5.0. There is a growing interest to the use of chitosan in food products as an emulsifier and binder. In the production of meat products are widely used soy protein preparations were studied in emulsion properties and gel-forming ability, characterized by the degree of penetration of hydrated and temperature-controlled (up to 72 in the center, which corresponds to the modes of heat treatment of meat products) soy concentrate in the presence of chitosan samples [4].

The study of emulsifying ability (EA) and the degree of penetration to hydrated soy concentrate was add dissolved in serum (3% concentration) samples of chitosan. Preliminary studies showed that the optimal conditions to ensure high emulsifying and gelling capacity of the system, to observe in the content of dry chitosan from 0.15% to 0.25 %, by weight non-hydrated soy concentrate. Further increasing the concentration of chitosan in the mixture did not lead to significant changes in emulsifying and gel-forming abilities. Installed, the prototypes have a high emulsifying properties compared with the control. The data obtained showed that the introduction of chitosan increases the emulsifying capacity of more than 2.5 times.

In the formation and stabilization of emulsions the chitosans play the role of a thickener aqueous phase, which increases the sedimentation stability of the emulsion. Hydration soy concentrates (SC) carried out depending on the quantitative content of protein (protein content 14%). More dense and correspondingly smaller values of the indicator of the degree of penetration compared to the control without chitin derivatives (15.5 mm) had samples with chitosan (10.5 mm). These data suggest that chitin derivatives have a significant impact on the strength characteristics of soybean concentrate, increasing its gel-forming ability that is also associated with exceptional hydrophilic polysaccharides.

CONCLUSION

Overall, the obtained experimental data allows concluding that the chitosan have a positive impact on TCF soy protein preparations, resulting in higher baseline emulsifying and gel-forming abilities of soy concentrates. It is known that the products of chitin are aggregated in complexes with proteins of meat; such a system has a high gel-forming ability. However, the use of chitosan in meat production is poorly known, therefore, investigated the effect of chitosan on the functional and structural-mechanical characteristics of the meat stuffing systems, namely: the stability of the emulsion (SE), characterizing the ability to form emulsions with proteins of meat and limiting shear stress (PNS), as gel-forming indicator. The quality of meat raw materials used chilled beef with pH 6.0 and pork with a pH of 5.8.

The experimental data indicated a significant higher Deposit separate FCS meat of the system when making a solution of chitosan. The rate of SE in the control sample was 6.8% and the introduction of products of processing of chitin reached 63,0 %, PNS ranged from 410 PA to 840 PA, respectively. In the result of the research was the quantitative determination of products of processing of chitin (%) in a joint introduction to the mass of raw meat.

REFERENCES

[1] Vladimir Vsevolodovich Sadovoy, Sergei Nikolayevich Shlykov, Ruslan Saferbegovich Omarov, and Tatiana Viktorovna Shchedrina. Res J Pharm Biol Chem Sci 2014;5(5):1530-1537.

[2] Vladimir Ivanovich Trukhachev, Vladimir Vsevolodovich Sadovoy, Sergei Nikolayevich Shlykov, and Ruslan Saferbegovich Omarov. Res J Pharm Biol Chem Sci 2015;6(2):1347-1352.

[3] Shaliko Zhorayevich Gabriyelyan, Igor Nikolaevich Vorotnikov, Maxim Alekseevich Mastepanenko, Ruslan Saferbegovich Omarov, and Sergei Nikolayevich Shlykov. Res J Pharm Biol Chem Sci 2015;6(3):1345-1350.

[4] Natal'ja Jur'evna Sarbatova1, Vladimir Jur'evich Frolov, Olga Vladimirovna Sycheva, and Ruslan Saferbegovich Omarov. Res J Pharm Biol Chem Sci 2015;6(4):962-965.