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RESEARCH OF TECHNOLOGICAL FACTORS IMPACT ON OBTAINING PROCESS OF DAIRY-PROTEIN CO-PRECIPTATES WITH VIBURNUM

One of the most important problems today is the dietary protein deficiency, which is constantly growing. World production of animal food protein is 4 times less than needed. The general protein deficiency in the planet is estimated at 10-25 mln. tons per year [1,2].

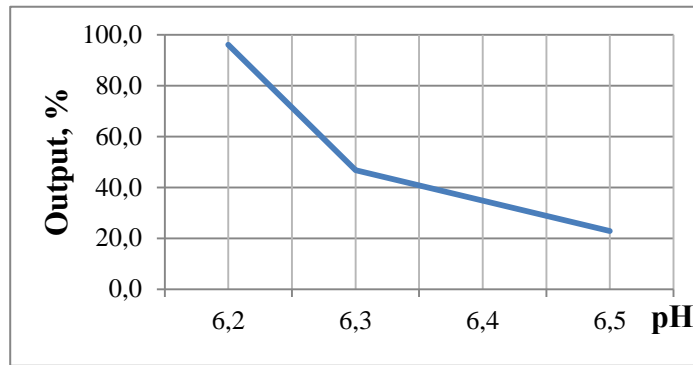
One of the promising directions of this problem solution is the production of protein concentrates and co-precipitates made of dairy recyclables, particularly buttermilk, whose use in food technology will not only permit to get products with high nutritional and biological value, but, considering the substantive volumes and the low cost of raw materials, also significantly economize on their production.

The basis for obtaining protein-carbohydrate co-precipitate of buttermilk is the concentration of the protein phase, often by thermo-acidic or thermo-calcium coagulation [3]. However, the products obtained by these methods have a number of imperfections, including tight and sufficiently elastic texture, calcium flavor, etc., which complicates their subsequent use in food technology. To improve the quality of the obtained concentrate it is advisable to improve existing co-precipitate methods that will aim to reduce the number of manufacturing operations and to improve the chemical composition of the final product.

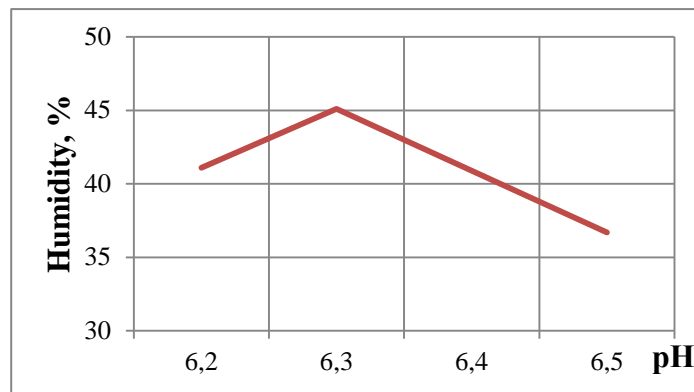
One of the ways to achieve this aim is the precipitation of dairy recyclables protein due to the impact of local plant products own acids, including viburnum. Viburnum berries are characterized by a high content of free amino acids and pectin (10...18%) that regulates cholesterol quantity, positively influences on the intracellular respiration reactions and metabolism, increases resistance to allergic factors, rides the body of radionuclides and heavy metals [4]. Viburnum contains sugars, mainly glucose and fructose, vitamin C, bioflavonoids. Viburnum berries contain significant amounts of antioxidants (beta-carotene, vitamin P, E and ascorbic acid), which are effective protection against free radicals and which the human body is not capable to synthesize. Moreover, the composition of viburnum includes 1,9% organic acids (malic, valeric, formic, acetic, caprylic et al.), suitable for use as coagulants [5].

The technological process of buttermilk co-precipitate obtaining under the influence of viburnum organic acids is reduced to the following operations: buttermilk pasteurization ($t = 90 \dots 95 \text{ }^\circ\text{C}$) during 10-15 minutes, its cooling to $60 \text{ }^\circ\text{C}$, add of mashed viburnum, coagulation, cooling and bunch filtering. During the technological process casein forms the bunch in IEP (pH 4,6 ... 4,7) and whey proteins under impact of high temperatures denature and aggregate subject to the availability of additional coagulation centers (cellulose, pectin) and denatured casein flakes. The degree of proteins excretion of buttermilk depends on a number of parameters, among which there are the amount of casein and whey proteins, ionic strength, length of heating and so on.

One of the co-precipitation defining parameters is pH of environment in which the precipitation of proteins occurs. To investigate the influence of pH on quantitative and qualitative characteristics of the obtained bunch, different amounts of mashed viburnum (1,5 ... 5% of the raw dairy) were added to buttermilk for pH variation. After adding of mashed berry the coagulation was conducted at a temperature of $80 \text{ }^\circ\text{C}$ during 15*60 sec. After precipitation the coagulant was filtered and subjected to self-pressing during 1...1,5 h. The research results are shown in graph. 1 and 2.



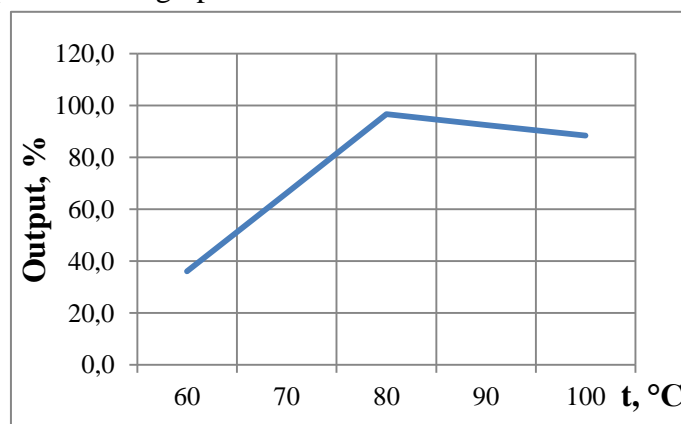
Graph.1. The dependence of the co-precipitate output on pH



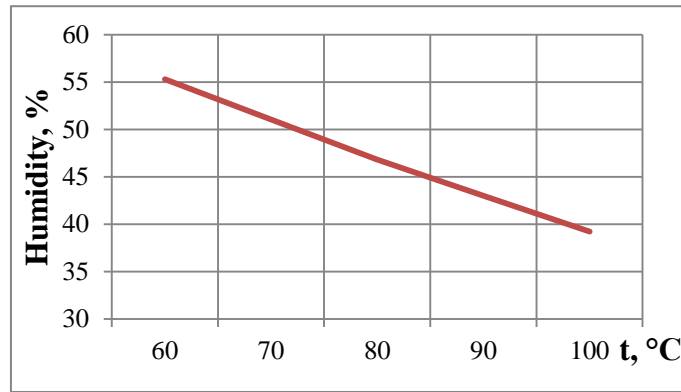
Graph.2. The dependence of the co-precipitate humidity on pH

The experimental results indicate a significant impact of the active acidity on the bunch quality. With the displacement of the pH to the alkaline side the bunch weight significantly reduces. The humidity of co-precipitate gradually increases to the pH limit 6,1 ... 6,3 and then sharply reduced.

Significant impact on the buttermilk protein co-precipitation process has the temperature of deposition. To study the influence of different temperatures on the quantity and quality of the final product, the coagulation was performed in the range of 60 ... 95 °C during 15*60sec. Before the beginning of coagulation mashed viburnum was added to the pasteurized buttermilk in an amount of 2,5-3% of raw dairy, which corresponds to the pH 6,1 ... 6,3. The research results are presented in graph. 3 and 4.



Graph.3. The dependence of the co-precipitate output on the temperature of deposition



Graph.4. The dependence of the co-precipitate humidity on the temperature of deposition

Analysis of the obtained data indicates a significant influence of temperature on the quantity and quality of the final product. Thus, while heating the system to 75...80 °C amount of precipitated protein increases and while further rise of the temperature it starts to decrease. Humidity content of the bunch reduces with increasing of temperature, which negatively affects the consistency of the product: from soft and smear it turns into tight and rubber. This is due to fact that the humidity excretion of protein mass polymers passes more intensive under impact of high temperatures and viburnum acids what makes consistency of co-precipitate denser.

On the basis of the research the expediency of the mashed viburnum addition to the buttermilk in an amount of 2,5 ... 3% of the raw dairy mass and the leading of the protein precipitation process at a temperature of 75...80 °C was defined. The chosen modes not only predetermine maximum precipitation of buttermilk proteins, but also provide the obtaining of bunch with the best organoleptic characteristics.

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