

RESEARCH OF THE SECONDARY MILK RAW MATERIALS PURIFICATION FROM PROTEIN COMPONENTS BY NATURAL POLYSACCHARIDES

Sergey P. Babenyshev¹, Andrey A. Bratsikhin¹, Vladimir E. Zhidkov², Dmitriy S. Mamay^{1*}, Muhamadjon Nurullo¹, Dmitriy S. Khokha¹

¹Institute of Life Sciences, North Caucasus Federal University, Kulakova Avenue 2, 355029 Stavropol, Russian Federation

²Technological Institute of Service (branch) of Don State Technical University, Kulakova Ave. 41/1, 355029 Stavropol, Russian Federation

*e-mail: dima-mamay@yandex.ru

Abstract

Membrane separation processes at most modern milk processing enterprises are included in standard technologies for processing of secondary milk raw materials. However the separations process could still be improved by pre-cleaning of raw materials with plant polysaccharides using. The purpose of the work is an experimental study of the process of preliminary purification of secondary milk raw materials from protein components by natural polysaccharides before its membrane separation.

Fresh cottage cheese whey obtained under production conditions (nationwide standard (GOST R) 53438-2009) and liquid extract of Jerusalem artichoke tubers (industrial type) were used as raw materials. The key indicators of process effectiveness were identified: the ratio of serum and liquid extract, the mass fraction of solids in the working solution, its transmittance, and the thickness of the layer of precipitate formed. To determine the main parameters of the studied raw materials generally accepted methods had been used: the ratio of serum and liquid extract was experimentally determined depending on the optimal physical and chemical composition, and the mass fraction of solids in the working solution was found by refractometric method, and the thickness of the layer of precipitate formed was experimentally measured by caliper rule.

It was found that the highest degree of preliminary purification could be achieved with the following indicators: solids - 7.5 - 7.7%, (including: lactose - 4.4 - 4.5%, total nitrogen - 0.6 - 0.7%, milk fat - 0.06 - 0.1%, minerals - 0.6 - 0.7%, insulin - 1.2 - 1.3%, pectin - 0.5 - 0.6%, the acidity of the working solution was 18 - 20 °T, the density was 1030 - 1035 kg/m³, the sediment layer thickness was 9 - 10 mm and the ratio of cottage cheese whey and Jerusalem artichoke liquid extract had been established at 70 : 30 volume units. Subsequent membrane separations of the membrane permeability of the cottage cheese whey purified at the previous stage could be increased by 16 - 21% in comparison with the traditional method of ultrafiltration.

The experiments proved that at the subsequent membrane separations of the cottage cheese of whey purified at the previous stage the membrane permeability could be increased by 16 - 21% in comparison with the traditional method of ultrafiltration with the same membrane's porosity. The fact of plant polysaccharides enrichment of curd whey has been established, that could be considered as a positive effect for functional foods development.

Key words: Plant polysaccharides, Milk raw materials, Cottage cheese whey, Membrane separation.