MATHEMATICAL MODELING OF THE DYNAMICS OF HEAT AND MASS TRANSFER IN MULTIPANEL ROASTER.

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The development of effective regimes of wet-heat treatment (roasting) of oilseed crops, which is an integral part of the process of production of vegetable oils, is aimed at increasing the yield and quality of oil and optimizing energy consumption during its implementation. The roasting modes are determined by the laws of the processes of heat and mass transfer in dispersed porous systems, the research of which experimentally presents a technically complex and costly problem.

Goal. Creation of an adequate mathematical model and a method of calculating the dynamics of heat and mass transfer and phase transformations when frying raw suspension.

Results of work. The mathematical model is based on the differential equation of the substance transfer [1], taking into account the following conditions. The frying is carried out in multipanel roasters and includes two stages: wetting in the first vat of crushed raw material, usually by the sharp pair, to the optimal for further processing of the values of moisture content and temperature; drying in the rest vats of a wet of the oil raw materials, which creates the optimal structure of the pulp for further pressing. The vats of each section of the roast are cylindrical and represent turbine mixers with flat vanes near the bottoms. The rotational movement of the stirrers causes the complex movement of individual particles of the pulp, increasing the porosity of the disperse layer. The walls of the vats are heated due to the heat of condensation of a deeply saturated vapor. Evaporation of moisture from contacting with the walls of the layers, and its output on the outer surface of the layer provides self-heating particles.A layer of peppermint is considered as a multicomponent colloidal capillary-porous disperse system, which includes a skeleton, a liquid phase in the form of water and oil and a steam-and-gas mixture. The forced moistening of the pulp in the first vat leads to filling by water of the transport pores of the disperse system and allows us to assume that the liquid phase is evenly distributed over the volume of the layer. The concentration of oil in the pulp does not change during the roasting process, so the mass transfer occurs in the form of liquid, steam and air phases, as well as due to phase transformations.

Conclusions. Comparison of the results of mathematical modeling with the data obtained from calculations of material and thermal balance for each tank in the process of roasting castor pulp shows the adequacy of the mathematical model and the efficiency of the calculation method.

1. Nikitenko N.I, Snezhkin Yu.F., Sorokova N.N, Kolchyk Yu.N. Molecular Radiation Theory and Methods for Calculation of Heat and Mass Transfer. K .: Scientific Opinion, 2014. 744 p.