INVESTIGATING THE DRYING PROCESS OF SINGLE DROPS OF SHIITAKE MUSHROOM SUSPENSION

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Powdered shiitake (medicinal mushroom) has a number of advantages in terms of dosing, mixing, packaging, transportation processes, and, unlike fresh mushrooms, it can be stored in this form for a year. Taking into account the therapeutic potential of its oncostatic and immunoregulatory polysaccharide complex, the powder form is more convenient to use as a therapeutic dietary supplement for cancer patients.

The objective of this work was to determine rational thermal engineering modes for spray drying the mushroom suspension based on the results of investigating the kinetics of drying single drops of the suspension in the stream of heated fluid.

The process of drying single drops of the mushroom suspension obtained after DPEI treatment (discrete pulse energy input) of a shiitake mushroom with the addition of water was investigated in the drop-vapor-gas medium system on a test stand in a stream of heated fluid at 140, 160, 180, and 200°C and at 0.5 m/s. The size of the drops that were being dried were constituted ~1.5 mm. Using a digital microscope, the process of dehydrating drops was captured on video, and the physical state of dried particles was studied using a special thin metal probe, which gave an idea of the properties of the liquid and dried material.

Investigations have shown that drops of the mushroom suspension are fully dried, but the dried portion in the stream of fluid is loose, easily deformed and torn when touched with the probe. After cooling outside the stream of the heated fluid, such particles harden, but become fragile, which will result in destruction of particles in the drying chamber as a result of friction and formation of a significant amount of a fine powder fraction that may be lost with the spent fluid. In addition, high temperature (200°C) was found to darken the particles, which indicates the destruction of valuable biologically active agents of the mushroom.

In order to improve the drying conditions, to increase the thermal stability of the material and strengthen the structure of dried particles, the use a dextrin-containing structuring agent was considered to be reasonable. Thus, different amounts of β-cyclodextrin were injected into the suspension. Investigation of drying of single drops of the suspension with cyclodextrin showed a slight increase in the total drying time, but the dried particles showed greater thermal stability and elasticity in the stream of heated fluid but greater hardness and strength when cooled. Based on the results of investigations, the rational parameters of the initial mushroom suspension fed to the dryer, and the thermal engineering parameters of preparation and spray drying were determined.