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ADSORPTION STUDIES OF FUNCTIONAL QUICK COOKING PRODUCTS ON THE EXAMPLE OF BORSCH

SCIENTIFIC RESEARCH GROUP:

ORCID ID: 0000-0001-7385-8495 **Zhanna Petrova**
Doctor of Technical Sciences, senior researcher, chief researcher
Institute of Engineering Thermophysics
of the National Academy of Sciences of Ukraine

ORCID ID: 0000-0002-6705-1000 **Yuliia Novikova**
Ph.D., junior researcher
Institute of Engineering Thermophysics
of the National Academy of Sciences of Ukraine

ORCID ID: 0000-0002-5169-4466 **Kateryna Samoilenko**
Candidate of Technical Sciences, senior researcher
Institute of Engineering Thermophysics
of the National Academy of Sciences of Ukraine

Pavlo Petrov
graduate student, junior researcher
Institute of Engineering Thermophysics
of the National Academy of Sciences of Ukraine

UKRAINE

Modern nutrition needs new high-quality products. The development of energy-efficient thermal technology for the production of innovative quick-cooking dry products for hot food for the population is an important task, since people's health depends on it [1].

The processes of drying colloidal capillary-porous materials belong to complex energy-intensive technological processes, in each specific case it is necessary to preserve biological activity, nutritional properties of raw materials, bacterial requirements for the product, etc. Branches that use drying processes are characterized by distributed energy consumption and a low energy efficiency ratio (≈ 40-50%) [2]. From dried plant materials, such as vegetables and fruits, it is possible to create functional instant products in the future.

One of the important indicators in the development of heat technology is the equilibrium humidity, which indicates the final moisture content of the material during drying, determines the storage conditions and makes it possible to reduce energy costs for the process. Therefore, it was important to determine the equilibrium humidity both for monopowders, functional powders, and for quick-cooking products based on them.

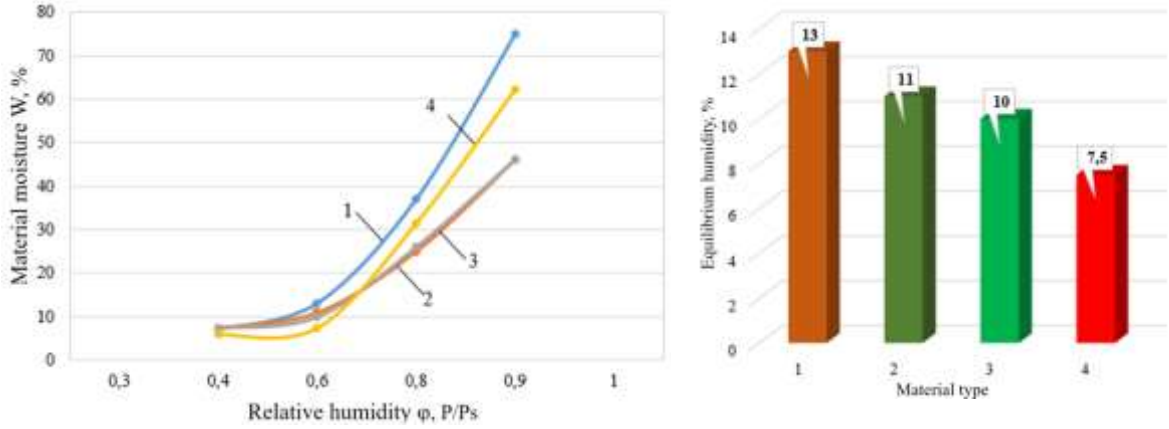
For research, developed functional quick-cooking products using the example of quick-cooking borscht, on dried vegetable raw materials, were used. The developed instant borscht, which does not require boiling, is steamed with water at a

temperature of 90-100ºC for 6-7 minutes. The increased use of antioxidants with food is recommended by the Ministry of Health as a means of reducing the risk of cancer and cardiovascular diseases. Antioxidants in borscht include beetroot betanin and carotenoids from carrots, red peppers and tomatoes. The concentration of antioxidants in our borscht is 4-5 times higher than in raw vegetables. Borscht is also a concentrate of dietary fibers that provide the normal functioning of the gastrointestinal tract and the body with prebiotics.

To determine the equilibrium humidity of the test samples depending on the relative humidity of the air φ, the tensometric (static) method of Van Bamelen was used. The essence of Van Bamelen's method is covered in previous publications [3].

Water vapor adsorption isotherms of functional powders and quick-cooking products based on them were constructed on the basis of the conducted research (Fig. 1.a). One of the main ingredients of dry borscht are carrot and beet powders. With a value of φ = 0.4, the equilibrium moisture content of all the studied samples is within 6-7%. At φ = 0.8, the equilibrium moisture content of beetroot-rhubarb and beetroot-lemon powders is the lowest, almost the same and is 24-25%, carrot powder - 38%, and dry borscht about 31.5%. At φ = 0.9, the moisture value for carrot powder is 76%, for beet-containing powders 48%, and for dry borscht 62%.

The comparative characteristic of the equilibrium humidity at φ = 0.6 of carrot, beetroot-lemon, beetroot-rhubarb powders and dry borscht based on them is presented in Fig. 1.b. As can be seen from the figure, the equilibrium moisture content of carrot powder is the highest - 13%, beetroot-lemon and beetroot-rhubarb powders are 11% and 10%, respectively, and dry borscht is only 7.5%.



a) *b)*

Fig. 1. **Water vapor adsorption isotherms (a) and equilibrium humidity (b) of mono- and combined powders and quick-cooking products based on them: 1 – carrot; 2 – beet-lemon; 3 – beet-rhubarb; 4 - dry borscht**

When storing functional powders and quick-cooking products based on them, in order to preserve their technological properties, it is recommended to maintain the following conditions in the room: air humidity 60-70% at a temperature of 20-25 ºC and to pack them hermetically.

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