

ENTROPY (NEGENTROPY) CONTROL AS THE CONDITION FOR INTELLIGENT VALORISATION OF FOOD RAW MATERIALS

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Introduction. As known, *entropy* is a state function of the system, which characterizes its disorganization, chaos. *Negentropy*, *ectropy* or *syntropy* are various terminologically rare names for the system organization. The term of “*negentropy*”, as a philosophical antipode of entropy, was introduced in scientific circulation by the famous Erwin Schrödinger [1]. This term is most often used in relation to living systems. We drew attention to some interesting patterns that connect the organization of the system with the problem of stability of food raw materials components (sometimes transformed into wastes).

Materials and methods. Causes of walnuts pomace browning, low yield of pressing and quick oxidation of flaxseed oil, were analyzed from the point of view of system organization changes during traditional technological treatments of food raw material. Mathematical models, describing entropy of seeds, were obtained by their extrapolation to classical statistical approach.

Results. By virtue of their ability to give life to new full-fledged organisms, seeds are real concentrates of high-energy and biologically active compounds, which initially indicates their highly entropic state. At the same time, the oleaginous seeds, as walnut drupe or flaxseed, they are the bright examples of a hierarchical structure, corresponding to low entropy level. It should be designated the following hierarchical levels of seeds structure: I - Seed (drupe); II - Separated parts of the seed; III - Tissues differing in function and composition; IV - Phases in contact within level III, but which can be relatively easily separated by pressing or extraction; V - Separate classes and groups of compounds, the separation of which from each other requires the use of several operations, sometimes with partial or complete degradation of other classes and / or groups of the same level; VI - Products of deep physical and chemical processing, for example, obtained by acid-base or enzymatic hydrolysis of classes and groups of the V-th level. The coexistence of chemically incompatible components within the seeds is provided precisely by the organizational structure of the seed, its negentropy. In our opinion, confirmed by mathematical modelling, the chemically incompatible components are located on different vertical branches of the organization. During technological processes, for example, ordinary pressing, it is obvious that the vertical levels of organization are disturbed, and the system from an organized low-entropy state passes into an unorganized high-entropy state.

Conclusions. The processing of food raw materials into useful products should take into account not only a chemical composition of the raw materials, but also its horizontal and vertical organization (negentropy). In this case, we will not face the difficult task of valorization of high-entropy waste, but on the contrary, we will not initially transfer valuable organic substances to the category of “wastes”.

Keywords: *flaxseed, hierarchy, mathematical models, vertical organization, walnut drupe*

References

1. Schrödinger, Erwin. *What is Life - the Physical Aspect of the Living Cell*. Cambridge University Press, 1944.