

The research planned under the Project will be carried out in the field of fundamental research and will be concerning the recognition of the processes occurring during the osmotic dehydration in osmotic solutions based on concentrated fruit juices and herbal extracts as well as the influence of osmotic dehydration process on the content of volatile compounds in the dried material. Osmotic dehydration involves immersing a fresh raw material (eg apple) in a hypertonic solution (a solution with a higher concentration than the cellular juice), which causes the water contained in the raw material to enter into this solution, and solid substances from this solution penetrate into the raw material. This process is used as a pre-treatment before the drying process. As a result, it is possible to incorporate various substances contained in the solution into the dried material. The process of mass exchange between the raw material and the solution is influenced by a number of factors such as the physical and chemical properties of the raw material, the solution, as well as the duration of the process, pressure and application of ultrasounds or microwaves.

The main objective of the research is to explain the phenomena occurring during the osmotic dehydration process of selected raw materials in model osmotic solutions created on the basis of concentrated fruit juices, its filtrates and herbal extracts. It will be crucial to recognize what factors will affect the transition of aromatic compounds from the extracts of herbs (one of the components of the solution) to the dehydrated raw materials and determining how this process will affect the behavior of these compounds in the raw material during drying.

The planned research consists of several stages. The first stage concerns the determination of the physical and chemical properties of the model osmotic solution. The solution will be based on filtrates of concentrated fruit juices and extracts from herbs obtained through various extraction methods. Knowing the properties of this solution, tests of the osmotic dehydration process of the selected raw material (eg. apple) will be carried out. The next step will be to determine the impact of the osmotic dehydration process on the properties of the dehydrated raw material. Next, the drying of the dehydrated material using different methods will be carried out in terms of the content of volatile compounds, which is crucial as the osmotic dehydration process does not provide sufficient microbiological safety. In addition, these processes will be described using empirical mathematical models and neural networks.

Natural (native) compounds derived from herbs have a number of health-promoting properties. The most common way of administering herbs to the body is to consume infusions of dried herbs. During the drying of herbs there are significant losses of these compounds as a result it is necessary to consume very large amounts of infusions in order to obtain the desired effects. Consequently, by using the osmotic dehydration process with the use of herbal extracts, it will be possible to consume native herbs along with the dried material. The process of transferring volatile compounds during the osmotic dehydration process is not sufficiently recognized. The preliminary tests showed that a small change in the composition of the osmotic solution has a significant effect on the content of volatile compounds in the dehydrated raw material. The end result will be the recognition of the impact of a number of factors determining the mass exchange during the osmotic dehydration process, with particular attention to the properties of the osmotic solution.

Understanding of this process on selected raw materials and herbs will allow to recognize the mechanisms occurring during osmotic dehydration in solutions with the use of herbal extracts. Detailed knowledge of this process can be used to create new products with functional food characteristics.