

The subject of the project is to determine the efficiency of the adsorption of undesirable substances from vegetable oil concerning their physicochemical properties (composition, type of modification, and type of activation). Acquisition of basic knowledge will make it possible to create an adsorption mixture dedicated to reducing the amount of selected and undesirable oil components.

The process of adsorption of components dissolved in vegetable oils is a mechanism that is well known and used in the bleaching process, which is one of the elements of the process of refining edible oils, i.e., purifying the oil of all substances that are chemically not fats. It involves binding molecules of substances dissolved in oil on the surface of the adsorbents used, characterized by an extended specific surface area (internal dispersion) and insolubility in the substance from which the components are removed. There are many adsorbents, i.e., activated carbon, silica gel, zeolites, active metal oxides, etc. These adsorbents have different adsorption properties, and the profile of the substances they adsorb varies depending on the amount of adsorbent added or the conditions of the process.

Niche oils, i.e., oils extracted from the seeds or fruits of plants whose primary purpose is not processing in the oil industry and are not subjected to a complete refining process, are characterized by a high content of dissolved substances. Some of these components positively affect human health or the product's shelf life (phytosterols, carotenoids, essential fatty acids, polyphenols), while others cause product degradation. Technological processes, i.e., thermal pretreatment of the raw material and high-temperature pressing, increase the oil yield, but much more chlorophyll pigments, phospholipids, and free fatty acids enter the oil. Examples of oils extracted in this way include pumpkin seed oil and walnut oil. There is a lack of such adsorbents that effectively remove all undesirable substances and minimize the deterioration of health-promoting properties. Considering the above factors, it is necessary to define the parameters of adsorbents responsible for partially conducting the adsorption of selected nutrients from vegetable oils using adsorbents with known physicochemical properties. Therefore, the project aims to determine the effectiveness of adsorbents in removing undesirable substances from edible niche oils and test the possibility of adsorption of selected substances dissolved in pumpkin seed oil and walnut oil obtained by high-temperature pressing.

Activities have been divided into three stages to realize the adopted project objective. In the first stage, the initial quality parameters of the selected oils will be determined, and the adsorption capacity of the indicated adsorbents will be verified. In the second stage, the listed oils will be purified with various adsorbents based on bentonite, clays, kerolite, alumina, and activated carbon, with different compositional variants, modifications, and to varying temperatures of the process. Then, using known methods for determining solutes in oils, the effect of the adsorbent used on the profile of substances adsorbed from oil will be studied. In the third stage, based on the results of the planned research, an adsorbent mixture dedicated to removing excess chlorophylls, free fatty acids, and phospholipids from the niche oils selected for the study will be designed. The effect of the designed mixture on the adsorption of components from the oils will be validated experimentally using the methodology used in previous steps.

It is expected to obtain an adsorption mixture dedicated to removing undesirable substances from edible oils, namely chlorophyll pigments, free fatty acids, and phospholipids, but minimizing the removal of oil nutrients that positively affect human health (phytosterols, carotenoids, essential fatty acids, polyphenols). The project results will form the basis for initiating industrial research in a subsequent project.