

The aim of the project is to prove the hypothesis that high pressure processing (HPP) initiates changes in polyphenolic profile under model and real conditions. We will investigate both non-enzymatic and pressure-induced changes, as well as those induced by the influence of native fruit enzymes. These model solutions will be subjected to HPP treatment at different pressures (from 300 up to 1000 MPa) for the determination of polyphenol changes under HPP treatment. Furthermore, the obtained knowledge will be verified on fresh prepared cloudy apple juice rich in polyphenols, native tissue enzymes and other nutritional components.

Polyphenols are secondary metabolites of plants. They perform an important protective role, against free radicals and ultraviolet radiation. Moreover, phenolic compounds prevent from various diseases with oxidative stress, such as cancer, neurodegenerative and cardiovascular diseases.

High pressure processing (HPP) is non-thermal technique mainly used for food preservation, focusing on microbial safety. HPP treatment causes that products have a longer shelf-life: 4-6 weeks under refrigerated storage, depending on the pressure applied. HPP may lead to better extraction of polyphenols and enzymes from plant tissue accelerating oxidation reactions. In connection with the above, the examination of the mechanisms of the reactions under HPP treatment is essential for better understanding the changes in polyphenols profile.

The project will consist of four main tasks. The initial tasks will be carried out on model solutions in which the interactions between selected polyphenols and the mechanisms of their changes under the influence of high pressure will be investigated. Furthermore, oxidoreductive and hydrolyzing enzymes, sugars and vitamin C will be added to the model solutions to explain changes in polyphenols, to observe potential synergistic effects of enzymes in relation to simple phenolic compounds and to answer to the question which of the components of the model solutions have the greatest influence on the changes of polyphenols. The final task of the project is aimed at verifying the obtained knowledge on the example of a fruit matrix - apple juice. The polyphenolic compounds and other nutrients such as sugars and vitamin C will be quantified by advanced chromatographic techniques. Activity of oxidoreductive and hydrolyzing enzymes will be determined spectrophotometrically and titrimetrically, whereas changes of color parameters will be detected using colorimetric methods.

The obtained results will be important to the development of food sciences. Knowledge gained from this project should contribute to progress in understanding part of reactions between phenolic compounds that occur in all fruits. Analysis of the obtained results will allow for the better understanding of mechanisms of degradations/ synthesis/ polymerization of main polyphenolic in solutions containing oxidoreductive and hydrolyzing enzymes and/or sugars and vitamin C. Moreover, obtained results will allow to define and investigate potential synergistic effect of components used in model and real conditions. Project implementation will contribute to the possibility of presenting results at conferences, seminars and dissemination of knowledge in international journals. Increase of the scientific achievements and defense of doctoral thesis before the end of the project will be the aim of the Principal Investigator.