Streszczenie w języku angielskim (Abstract)

In recent decades, an increasing number of deaths associated with so-called lifestyle diseases has been observed, including cancer, cardiovascular disorders, and neurodegenerative diseases. The development of these conditions has been linked, among other factors, to disturbances in the metabolism of low-molecular-weight sulphur compounds, which may contribute to the intensification of oxidative stress and disruption of redox homeostasis in the human body. Consequently, the determination of thiols and their derivatives in biological matrices such as plasma and urine is of particular importance for health monitoring and the identification of early pathological changes. At the same time, growing attention is being paid to the analysis of food for thiols content, including berries, which are an important source of bioactive compounds with antioxidant properties. According to the literature, a properly balanced diet rich in essential nutrients may help reduce the incidence of lifestyle diseases or slow their progression.

In the analytics of thiol compounds, access to reliable and sensitive analytical tools capable of their determination in complex biological and food matrices is of crucial importance. This is due to their low concentrations, high reactivity, and susceptibility to redox transformations, which impose stringent requirements on newly developed analytical methods. High-performance liquid chromatography (HPLC) is one of the fundamental techniques used in the analysis of thiol compounds in both biological and food samples. Its widespread application in the analysis of low-molecular-weight sulphur compounds result from its high selectivity, sensitivity, and ability to efficiently separate components present in complex matrices. When coupled with appropriate detection techniques, such as UV detection (HPLC-UV) or mass spectrometry (HPLC-MS/MS), it enables the generation of reliable qualitative and quantitative results, even for analytes present at very low concentration levels.

The aim of this doctoral dissertation was to develop analytical tools based on high-performance liquid chromatography coupled with various detection modes, dedicated to the determination of selected biologically important sulphur compounds in biological fluids and so-called superfruits. During the study, particular attention was paid to the optimization of sample preparation procedures for chromatographic analysis, with the aim of their maximal simplification to improve the precision and

accuracy of determinations, reduce sample preparation time in routine applications, and reducing environmental impact of the developed methods. An important aspect considered during these optimizations included the characteristics of the applied measurement techniques, the physicochemical properties of the analytes, as well as the composition of the investigated matrices.

As a result, four analytical methods based on HPLC-UV and HPLC-MS/MS techniques were developed, enabling the determination of low-molecular-weight thiols and their derivatives in both human biological fluids (urine, plasma) and plant samples, namely berries cultivated in Poland.