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Summary of doctoral dissertation:
Biocomponents from berry seeds obtained by extraction with supercritical carbon dioxide.

Summary

The main objective of this doctoral dissertation was development of technological foundations for extraction of oil biocomponents from berry seeds via the application of extraction with supercritical carbon dioxide.

Berry seeds are waste material in production of fruit juices and preserves. Chemical analyses showed that they contain numerous valuable chemical compounds including essential fatty acids (EFA). Therefore, they can be the source of oils with a favorable balance of unsaturated fatty acids ω–6 and ω–3. The precondition for the application of these berry seeds is the development of the technology ensuring the high recovery of the substance, human health safety and low impact on environment. The extraction of oils with the use of supercritical carbon dioxide fulfils the above mentioned conditions. It also belongs to the group of modern so-called Green Chemistry technologies.

In order to realize the stated objectives, studies in the scope of identification of parameters which may have an impact on the extraction process were carried out. The strategy applied in the studies assumed carrying out laboratory scale tests aided with statistical instruments to analyze the data and then to scale-up the process and develop technological assumptions for industrial scale applications.

Under this doctoral thesis, studies of berry seeds oils solubility in supercritical carbon dioxide were carried out. The extraction of oil biocomponents with supercritical carbon dioxide constitutes the experimental part of this doctoral dissertation. Studies were carried out based on Design of Experiments (DoE) and Response Surface Methodology (RSM).

The obtained results allowed for the specification of significant explanatory variables, such as: temperature, pressure and extraction time which were then used for the process optimization. Finally, the detailed solutions for desirability function fulfilling the criteria of multi-objective optimization were proposed and the obtained results of mathematical modeling were experimentally verified.

Based on the conducted research and analyses, the technological assumptions for extraction of berry seeds at industrial scale were made for research-production plant of New Chemical Syntheses Institute. An economic analysis of the process which indicates the profitability of the production of oil biocomponents according to the applied technology and the commercial potential of the obtained product was carried out.