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OPTIMIZATION OF EXTRACTION CONDITIONS FOR THE EXTRACTION
OF BIOACTIVE COMPOUNDS FROM ARONIA POMACE

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Aronia pomace is a by-product of Aronia fruit processing that contains a wide range of bioactive compounds such as polyphenols, anthocyanins, and antioxidants. The bioactive compounds of Aronia pomace have increasing importance to researchers in the field of food and health, as they are thought to be largely responsible for quality of food products and the health benefits of this popular fruit by-product. Optimizing extraction conditions using ultrasound-assisted extraction (UAE) involved determining the optimal extraction conditions for extracting bioactive compounds from Aronia pomace. UAE method is an important area of research as it is a green extraction method, potentially improve the efficiency of extraction, high reproducibility, reduce extraction time, reduce processing costs, and increase the yield of bioactive compounds. The extraction conditions are temperature, ultrasound exposure time, and water bath time. These conditions could significantly affect the yield, and the optimal conditions vary depending on the target bioactive compounds. The extracted bioactive compounds could have applications in food, pharmaceutical, and cosmetic industries. Therefore, this research, ultrasound-assisted extraction of bioactive compounds from Aronia pomace aimed to optimize those extraction conditions through investigate efficiency of extraction conditions with focusing on color parameters, anthocyanin content, polyphenol concentration, and, antioxidant capacity. The methods involved were using lyophilized Aronia pomace sample which were grounded to a fine powder, different extraction solvents 50% ethanol with 1% citric acid, 50% glycerol with 1% citric acid, and 100% water with 1% citric acid solvents and ultrasonic equipment were used. The solvents were chosen because of their good solubility, green solvent for the extraction of bioactive compounds, low toxic, and act as a chelating agent, which improve the solubility and stability of bioactive compounds during extraction. The appropriate ratio of samples with solvents were mixed following the laboratory protocol and subjected to different range of extraction conditions, temperature, water bath time, and ultrasound exposure time to determine the optimal conditions for extracting bioactive compounds from Aronia pomace. After this operation the extracts undergone to centrifuge with fixed spinning time of five minutes. The filtrate placed to refrigerator until analysis made. The extracted compounds were then analyzed using different techniques. The total polyphenol content, total anthocyanin content, and antioxidant capacity determined using UV/Vis. spectrophotometry; While the main anthocyanin contents quantified using the analytical technique, high-performance liquid chromatography (HPLC). The results of this study provided valuable insights into the optimization of ultrasound-assisted extraction conditions for extraction of bioactive compounds.

The study showed that the optimal extraction conditions for the extraction of bioactive compounds from Aronia pomace using the solvent 50% ethanol with 1% citric acid: The total phenolic content was (3904.02 mg GAE/100 g FM) and antioxidant capacity (3535.27 mg AA/100 g FM) were 50 °C, 60 minutes water bath time, and 30 minutes of sonication time; while total anthocyanin content (721.36 mg CGE/100g FM) were 40 °C, 60 minutes water bath time, and 15 minutes of sonication time. The optimal extraction conditions treated with 50% glycerol with 1% citric acid: Total phenolic content (3508.5 mg GAE/100 g FM) with 40 °C, 60-minute water bath time, and 15 minutes of sonication time; while antioxidant capacity (4039.01 mg AA/100 g FM) and total anthocyanin content (638.86 mg CGE/100g FM) were 40 °C, 120 minutes water bath time, and 15 minutes of sonication time. Besides, the optimal extraction conditions treated with 100% water with 1% citric acid: total phenolic content (1236.88 mg GAE/100 g FM) and antioxidant capacity (1693.84 mg AA/100 g FM) were 60 °C, 120 minutes water bath time, and 15 minutes of sonication time; while total anthocyanin content (389.67mg CGE/100g FM) were 50 °C, 60 minutes water bath time, and 15 minutes of sonication time. Among these solvent extractions, the optimal yield found as TPC (3904.02 mg GAE/100 g FM) with 50 °C, 60 minutes water bath time, and 30 minutes of sonication time; and TA (721.36 mg CGE/100g FM) with 40 °C, 60 minutes water bath time, and 15 minutes of sonication time were found using 50% ethanol with 1% citric acid; While FRAP (4039.01 mg AA/100 g FM) with 40 °C, 120 minutes water bath time, and 15 minutes of sonication time were found using 50% glycerol with 1% citric acid solvent. As a final, the results of this study could have important implications for the food, beverage, and other pharmaceutical industries. The use of ultrasound-assisted extraction could significantly boost the yield and quality of bioactive compounds. The main anthocyanin components with varying degree of extraction are cyanidin- 3-galactoside, cyanidin-3-glucoside, and cyanidin-3-arabinoside detected from the extract using HPLC. The study also covered the analysis of color of extracts; the color difference evaluated the total color change in Aronia pomace extract. The extraction conditions that had maximum influence were temperature, and ultrasound exposure time. It can be concluded that the UAE could operate effectively, easily, quickly, environmentally friendly, and maximized the yield under optimal extraction conditions. The efficiency of extraction conditions investigated and the optimal extraction conditions and results explained. These findings could be used for large-scale production of bioactive compounds for quality of food products and health.