

## ULTRASOUND-ASSISTED EXTRACTION OF PHENOLIC COMPOUNDS FROM BLACK ELDERBERRY FRUIT

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### Abstract

The objective of this study was to determine the most adequate process parameters, using a green extraction method, which ensures maximal utilization of *Sambucus nigra* L. fruit. Ultrasound-assisted extraction was applied for the isolation of phenolic compounds from elderberries and for obtaining extracts rich in anthocyanins. The UAE experiment was performed at sonication amplitude in the range from 20 to 100%. The highest extraction yield (47.28%) was achieved at 100% amplitude, while the lowest yield (27.70%) was achieved at 20% amplitude. The UAE extract of elderberry obtained at amplitude of 100% proved to be the best in terms of the content of total phenols and monomeric anthocyanins. According to the obtained results, it can be concluded that the suggested extraction approach has a potential for the production of new pharmacologically-active fractions.

### Introduction

*Sambucus nigra* L. belongs to the Adoxaceae family and naturally occurs in most of Europe. Flowers and fruit are rich in dietary phytochemicals, such as carbohydrates, proteins, lipids, fatty acids, phenolic acids, flavonoids, organic acids, minerals, vitamins, etc., that give them a high commercial value [1]. In Europe, elderberries are used for centuries in food industry to produce pies, jams, jellies, ice creams, and yogurts [2]. Polyphenols are the most important group of bioactive compounds present in elderberry in relatively high concentrations. Anthocyanins, as well as other flavonoids, exhibit antioxidant, anticarcinogenic, immunestimulating, antibacterial, antiallergic, and antiviral properties. Their consumption may contribute to prevention of several degenerative diseases such as cardiovascular disease, cancer, inflammatory disease, and diabetes [3].

### Experimental

Ultrasound-assisted extraction (UAE) was performed in an ultrasound probe (Hielscher Ultrasonic GmbH, Germany), which operated in continuous mode at a constant extraction time of 6 min. The milled elderberry fruit was added to an ethanol-water solution (30%) and the effect of sonication amplitude in the range from 20 to 100% was evaluated. According to our preliminary results, the selected extraction solvent showed the best extraction properties for this raw material. During the process, an increase in extraction temperature was measured. In obtained extracts, the content of total phenols and the content of monomeric anthocyanins were determined using spectrophotometric methods.

### Results and discussion

The highest extraction yield (47.28%) was achieved by using 30% ethanol during 6 min, at 100% amplitude, while the lowest yield (27.70%) was achieved at 20% amplitude. The change of the content of total phenols and anthocyanins followed the same trend as in the case of extraction yield. The UAE extract of elderberry obtained at amplitude of 100% proved to be the best in terms of the content of the investigated compounds. The highest total phenolic

content in elderberry extract was 4.23 mg GAE/mL of extract, while the highest monomeric anthocyanin content was 24.36 mg/L of extract. Total phenolic contents in elderberry extracts obtained at amplitudes of 20 and 60% were 2.52 and 3.61 mg GAE/mL of extract, respectively. During the process, an increase in temperature was recorded by applying all three amplitudes. As expected, the highest increase was recorded at amplitude of 100%, which was 66 °C after 6 min, while a lower increase in temperature was measured at 20 and 60% amplitudes (33 °C and 55 °C, respectively).

### Conclusion

Based on the obtained results, the UAE by ultrasonic probe proved to be suitable for isolation of phenolic compounds from elderberry fruit. The highest amplitude of ultrasound gave the best results in terms of the content of phenolic compounds, as well as anthocyanins, as the most important compounds in elderberry fruit due to their health-promoting effects. In future work, the influence of an increase in extraction time above 6 min on the extraction temperature will be investigated.

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### References

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