Optimization of the Ultrasound-Assisted Extraction (UAE) of antioxidant activity: A review

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Introduction

- Antioxidants important substances:
  - that slow, regulate, or inhibit oxidation and degradation of food quality when present in food.
  - minimize the risk of degenerative diseases induced by oxidative stress in the body
- Natural antioxidants have recently become important in replacing synthetic ones.
- The primary antioxidants in plant-based foods
  - Phenolic compounds,
  - Carotenoids
  - Vitamins C and E

- The demand for novel extraction techniques has been growing in the past few years:
  - To enhance efficiency.
  - Reduce processing cycles.
  - Reduce organic solvents usage.
- Ultra-sound-assisted extraction advantages:
  - Increases the rate and degree of mass transfer across the sample-solvent interface.
  - Involves mechanical disruption of the plant cell walls via acoustic cavitation, thereby allowing the solvent to permeate the cells and extract the compounds.

The aim of the study

- The existing literature has not investigated the effects of UAE optimization parameters on antioxidant activity.
- This study aims to provide a useful guide for e and future optimizations of ultrasound-assisted extractions.

Ultrasonic-assisted extraction devices

- Sonication is commonly conducted using:
  - Ultrasonic bath
  - Ultrasonic probe
- Operating in batch or continuous flow mode in laboratory scale extraction systems.

Optimization of antioxidant activity by using ultrasonic-assisted extraction

- Maximizing the ultrasound-assisted extraction of antioxidants:
  - The conservation of sample material and solvents.
- The process parameters are optimized by the response surface methodology (RSM).
- To attain optimum yield of antioxidant must optimize UAE parameters such as:
  - Time
  - Frequency
  - Power amplitude
  - Extraction temperature
  - Solvent-to-sample ratio
  - Solvent concentration
  - pH

- *The effect of ultrasonication power*
  - *increasing ultrasound power is attributed to the increased yield of antioxidant compounds (50 to 150 W).*
- *The effect of ultrasonic time*
  - *increasing ultra-sonication time to more than 15 minutes could result in the degradation of antioxidant properties.*
- *The effect of temperature*
  - Antioxidant compounds are easily hydrolyzed and oxidized at higher temperatures, primarily when

    extracted over extended periods (more than 45℃)

- *The effect of solvent concentration*
  - *increasing the solvent concentration beyond 50% decreased the antioxidant activity.*
- *The effect of Solvent-to-solid ratio*
  - more than 40 ml/g has remained almost unchanged on antioxidant activity
- *The effect of pH*
  - low pH resulted in a high level of antioxidant activity measured by the FRAP method (low to Near-neutral pH).

Conclusion

- The optimization of ultrasound-assisted extraction has been emphasized in this study.
- optimization has shown a substantial increase in antioxidant activity.
- optimal degree of the parameters helps to save energy
- lessultrasound power
- a shorter time.
- High temperatures can also be avoided.
- Save the solvent from being wasted during the extraction.
- helps decide the best antioxidant activity method acceptable or shows a heightened response with optimum parameters.


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Questions
&
And
A
Answers


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