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Olive residues as a source of bioactive compounds

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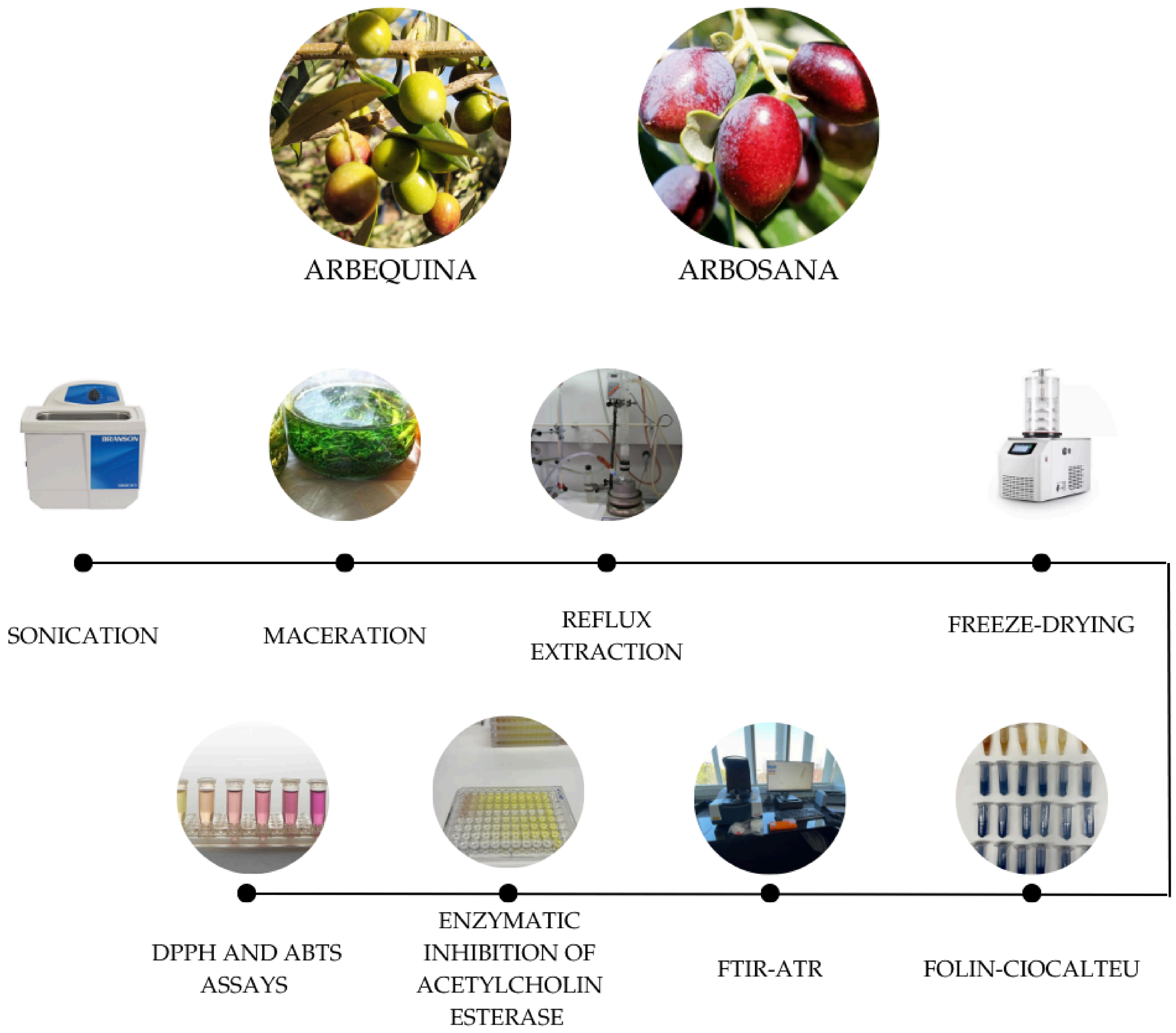
INTRODUCTION & AIM

Olive oil production is a thriving industry in Chile, contributing significantly to the global market with around 19,500 metric tons produced in 2022. The industry's growth is supported by the cultivation of highly productive varieties such as Arbequina and Arbosana, well-suited to Chile's climatic conditions. However, the production process generates considerable waste, particularly in the form of olive pomace, also known as alperujo, which poses environmental concerns due to its organic load and phytotoxicity. Alperujo, a mixture of solid and liquid residues, is abundant in bioactive compounds such as polyphenols, making it a promising candidate for valorization within a circular economy framework. The sustainable extraction and utilization of these bioactive compounds could provide innovative solutions for waste management while offering new applications in the food, pharmaceutical, and cosmetic industries. This study presents a comparative study on three extraction methods—sonication, reflux, and maceration—applied to olive pomace from the Arbequina and Arbosana olive varieties. The research focuses on the extraction yields, antioxidant capacity (via DPPH and ABTS assays), and enzymatic inhibition activities (targeting acetylcholinesterase and butyrylcholinesterase). The use of FTIR-ATR spectroscopy further aids in characterizing the bioactive compounds. The findings underscore the potential of olive pomace as a valuable resource for bioactive compounds, supporting the development of sustainable waste-reduction practices and fostering circular economy initiatives.

METHOD



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RESULTS & DISCUSSION

Table 1. DPPH/ABTS Radical Scavenging (%) at Different Concentrations for Reflux (SR), Maceration (M), and Sonication (S).

Concentra-tion (μg/mL)	SR Arbequina (%)	M Arbosana (%)	S Arbequina (%)
100	96.06/85.43	94.48/88.56	93.70/80.23
50	92.12/78.34	96.06/75.23	77.95/69.55
10	46.85/65.14	62.20/52.61	27.16/43.22

Table 2. Cholinesterase (AChE/BChE) Inhibition (%) for Different Extraction Methods (Sonicated, Macerated, Reflux) at Four Concentrations.

Sample	500 μg/mL (%)	250 μg/mL (%)	125 μg/mL (%)
Sonicated Arbequina	80.98/44.61	63.03/39.10	47.50/27.48
Sonicated Arbosana	80.81/0.00	65.64/44.01	47.85/19.30
Macerated Arbequina	74.29/56.74	62.29/30.88	50.83/31.77
Macerated Arbosana	82.41/52.95	68.58/29.43	43.02/11.92
Reflux Arbequina	80.75/40.63	63.81/0.00	53.13/0.00
Reflux Arbosana	83.21/43.37	63.97/32.13	49.19/15.54

Table 3. Wavelength Ranges in FTIR-ATR Spectrum and Possible Associated Functional Groups in Olive Pomace Extracts.

Wavelength Range (cm^{-1})	Functional Groups
1500-1600	C=C stretching (Aromatic rings, Flavonoid structures)
1735	C=O stretching (Esters, Carboxylic acids, Phenolic acids, Flavonoids)
2854-2925	C-H stretching (Methylene groups, Oleanolic acid, Maslinic acid)
3300	O-H stretching (Alcohols and phenols)

CONCLUSION

This study highlights the bioactive potential of olive pomace extracts from Arbequina and Arbosana varieties, demonstrating significant antioxidant and enzyme inhibitory properties. The reflux system was the most efficient for AChE inhibition, while maceration excelled in BChE inhibition. FTIR-ATR analysis suggests the presence of key phenolic compounds, such as oleuropein and hydroxytyrosol, along with triterpenoids like oleanolic acid and maslinic acid. These findings emphasize the importance of optimizing extraction methods to enhance the recovery of functional compounds for sustainable applications in various industries. Furthermore, the data suggest that tailored extraction techniques can selectively enhance specific bioactivities, which is crucial for targeting different industrial uses. Overall, the valorization of olive pomace contributes to a circular economy, reducing waste and promoting the efficient use of by-products in the food, pharmaceutical, and cosmetic sectors.

FUTURE WORK / REFERENCES

Upcoming studies should aim to identify and quantify the major components of olive pomace that have therapeutic potential for treating various diseases. This emphasis should be on identifying phenolic compounds and triterpenoids with antioxidant, anti-inflammatory, and enzyme inhibitory effects, particularly for neurodegenerative and metabolic disorders. *In vitro* assays could determine the potential of these extracts, along with baseline cytotoxicity assays.

1. Vitali Čepo, D., et al. Phenolic Composition and Bioactivity of Olive Pomace. Food Chemistry, 2018, 240, 1023–1031. https://doi.org/10.1016/j.foodchem.2017.08.032.
2. Dalla Costa, V., Sardella, R., et al. The Effect of Maturity Stage on Polyphenolic Composition, Antioxidant and Anti-Tyrosinase Activities of Ficus rubiginosa Extracts. Antioxidants, 2024, 13(9), 1129. Jha, A. K., & Sit, N. Extraction of Bioactive Compounds from Plant Materials Using Combination of Various Novel Methods: A Review. Trends Food Sci. Technol., 2022, 119, 579-591. https://doi.org/10.1016/j.tifs.2021.11.019..
3. Nunes, M. A., et al. Olive By-Products for Functional and Food Applications: Challenging Opportunities to Face Environmental Constraints. Innov. Food Sci. Emerg. Technol., 2020, 35, 139–148. https://doi.org/10.1016/j.ifset.2016.04.016.