



Valorization of wet apple pomace for pectin extraction

Pectin is valued by the food industry as a natural source of thickeners, stabilizers and emulsifiers and has applications in the pharmaceutical and cosmetic industries. Apple pomace is the second-largest source of commercial pectin production but remains underutilized due to the environmental and economic drawbacks of conventional acid extraction methods.

Green extraction technologies have the potential to improve the efficiency of pectin production from apple pomace, reducing extraction time and improving yields. This study explores the application of such approaches to dry and wet apple pomace from SDIC Zhonglu Fruit Juice Co., Ltd.

Project activity

For dry apple pomace, ultrasonic-assisted extraction was combined with deep eutectic solvents (UAE-DES). A single-factor and response surface methodology was used to optimise the process. The optimal conditions were identified as: choline chloride: citric acid (1:2 molar ratio), 30% water content (w/w), liquid–solid ratio of 40 mL/g, extraction at 81°C for 40 min, and ultrasonic power intensity of 25%. Under these conditions, a pectin yield of $25.06 \pm 0.87\%$ * was obtained (*amount of mass recovered as a % of original product). DES recyclability is currently under investigation.

For wet extraction, fresh undried pomace (75–80% moisture) was processed using enzymatic treatments (cellulase and xylanase) combined with physical methods (ultrasound or microwave). This approach yielded up to 20% pectin, an improvement over physical treatments alone, which yielded around 16%. Moreover, wet extraction, using undried pomace, avoids energy-intensive drying.

Key findings and recommendations

These approaches show promise for biorefineries and food processors seeking more efficient and cost-effective pectin extraction methods.

- Green extraction technologies used on both wet and dry pomace surpassed the 15% pectin yield typically obtained by conventional acid extraction.
- Extraction methods influence pectin characteristics: enzymatic extraction favoured low-methoxyl pectin (used in jams and jellies), while physical methods favoured high-methoxyl pectin (used in low-sugar products and pharmaceuticals).
- Future tests will include using DES on wet pomace, which may provide optimal environmental and economic conditions.



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