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Refining Bromelain Extraction: Procedures and Precipitant Effects on Enzyme Activity Recovered from Pineapple Peel

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Introduction

Pineapple (*Ananas comosus* Merr.) is extensively used in various food products due to its widespread popularity. The residue from pineapple, which contains valuable bioactive compounds like bromelain, offers an eco-friendly approach to waste management. Bromelain (Br), a protease prevalent in pineapples, can be extracted from waste parts, using methods such as solvent precipitation and ultrafiltration. An increasingly popular and environmentally friendly method for protein concentration and purification is polyelectrolyte precipitation, which preserves protein integrity while aiding separation.

Objective

This study utilized polyelectrolytic precipitation with carrageenan (Carr) to assess an efficient and sustainable method for extracting bromelain from pineapple peels.

Multiple purification steps were employed to obtain the optimal Br product for potential commercialization, including centrifugation, pellet washing, and varying concentrations of stock Carr

Methodologies

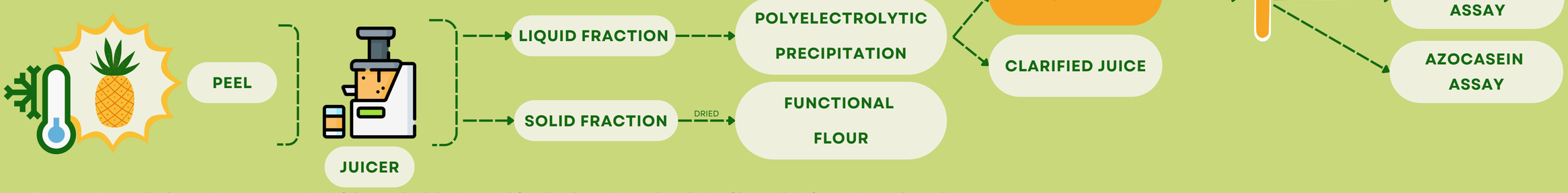

Figure 1 - General schematic representation of the methodologies used for the obtention and analysis of bromelain from pineapple peels.

Results

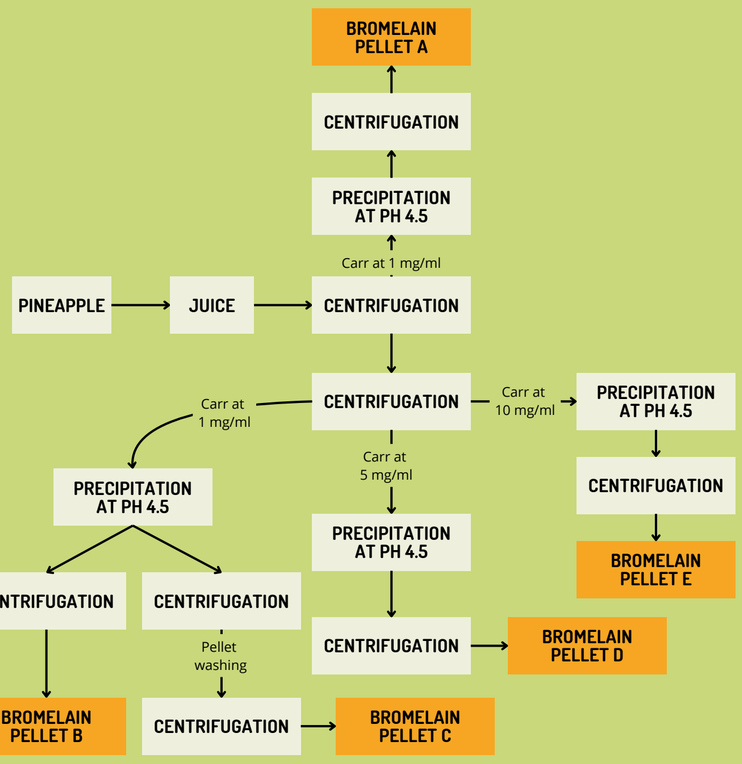

Figure 2 - Polyelectrolytic precipitation flowchart description for different bromelain pellets production (Pellet A, B, C, D and E). "Method for Extraction and/or isolation of bromelain from pineapple": Patent no. EP 3 252 156 A1.

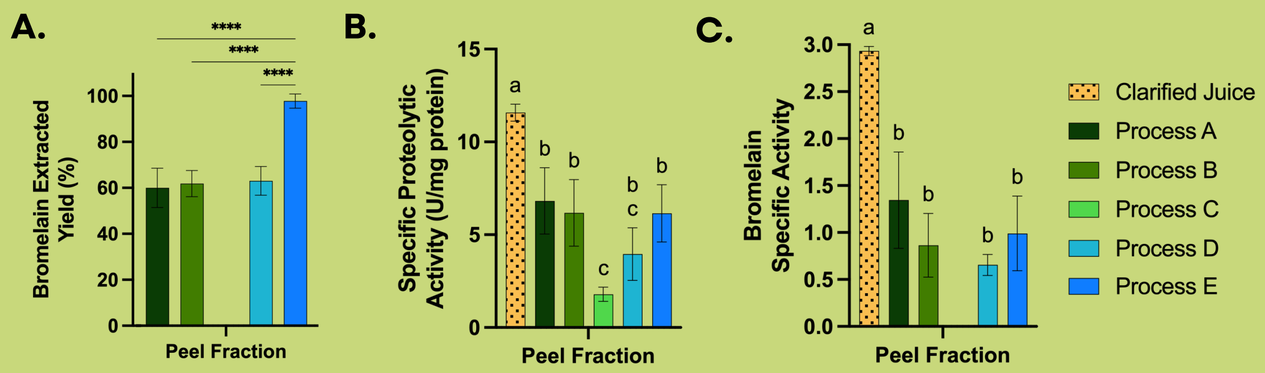

Figure 3 - (A) Extrated bromelain percentage yield obtained for all tested samples; (B) Specific proteolytic activity obtained for bromelain samples from peel pineapple fractions; (C) Bromelain specific activity obtained for all peel samples.

- Proteolytic precipitation methodology allows the extraction of stem bromelain
- Higher Carr concentrations tested allowed the obtention of higher yields of extracted bromelain with high activity
- The process doesn't affect the specific and proteolytic activity
- FPLC results confirmed the presence of stem bromelain in higher quantities

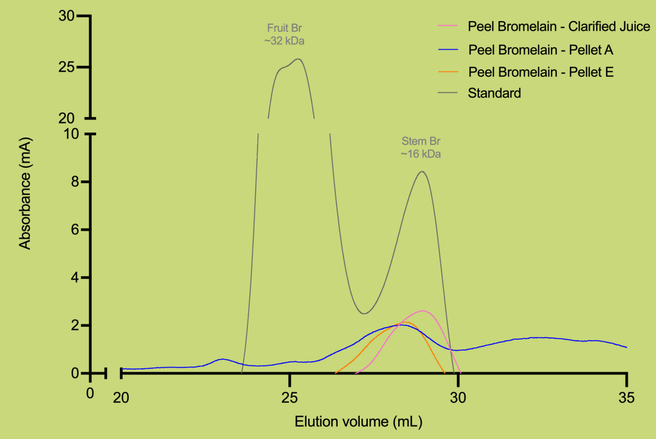

Figure 4 - FPLC profile obtained for peel samples precipitated with Carr 1 and 10 mg/ml.

Conclusion

Changes to the extraction process did not significantly affect the bromelain specific activity of peel samples. Specific proteolytic activity increased with Process A, likely due to higher free total protein post-precipitation and other interacting components.
Extracting bromelain from pineapple waste offers a sustainable solution for waste reduction and supports health-focused products, promoting a zero-waste approach in pineapple production.

Acknowledgdements

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| Conflict of Interest: The authors declare no conflicts of interest. |