



Sustainable Snacking: Development of a Functional Snack Using Apple Pomace Powder

Rita Vedor¹, Inês Soares¹, Daniela Machado¹, Telma Orvalho², Marco Alves², Ana Maria Gomes¹

¹Universidade Católica Portuguesa, CBQF - Centro de Biotecnologia e Química Fina – Laboratório Associado, Escola Superior de Biotecnologia, Rua Diogo Botelho 1327, 4169-005 Porto, Portugal

²INOVLINHA/TAGUSVALLEY – Science and Technology Park, Abrantes, Portugal

* e-mails authors: s-rcvedor@ucp.pt; s-icsoares@ucp.pt; dmachado@ucp.pt; telma.orvalho@tagusvalley.pt; marco_alves@tagusvalley.pt; amgomes@ucp.pt



Introduction

By-products of the food industry, generated during food processing, are frequently regarded as waste, despite their inherent value, which is attributable to the **presence of valuable compounds**. For example, by-products produced in the fruit and vegetable industry include **pulp, peel, seeds, skin, pomace, husks, pods and stems**, which collectively represent the majority of agri-food by-products (Reguengo *et al.*, 2022). Produced in large quantities, they represent a valuable resource rich in **dietary fibre and bioactive compounds** including polyphenols, carotenoids, glucosinolates, among others. Consequently, the food sector may find it advantageous to valorise these by-products in the development of **high nutritional value ingredients** aligning with sustainability and circular economy (Raŕu *et al.*, 2023; Mateos-Aparicio and Matias, 2019).

Objectives

This project sought to **repurpose a by-product** of the juice industry, specifically **apple pomace**. The objective of this study was twofold: firstly, to **formulate a snack** comprising the apple pomace powder, and secondly, to assess its **bioactivities**.



Methods

Production of Apple Pomace Powder



Grinding of Apple Pomace and Subsequent Drying

Production of Apple Based Snack



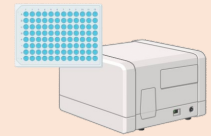
Mixing of 4 ingredients: Apple Puree, Apple Pomace Powder, Egg and Baking Powder
Baking at 200°C for 10 min, followed by 10min at 140°C

Extraction Protocol



Phenolic Content Extraction using 80% Ethanol

Determination of Bioactivities



Determination of Total Phenolic Content using Folin-Ciocalteu Method and Antioxidant Activity through ABTS Assay

Results



The proposed recipe yielded a product that exhibited characteristics reminiscent of grissino, thus designated '**Apple Chewies**'. The product exhibited:
- a **reddish hue** accompanied by a **golden tint**.
- a **crispy exterior** that is indicative of a well-formed **chewie texture on the interior**.

Bioactivities

Total Phenolic Content (mg of GAE/g of sample)	Antioxidant Activity (µmol of Trolox equivalent/g of sample)
2.954 ± 0.384	15.682 ± 2.164

The final product exhibited a **low-moderate level of total phenolic content**, with a proportionally **moderate antioxidant activity**.

Conclusions

The use of apple pomace powder resulted in the formulation of a novel snack with a **unique combination of flavour and texture; crispy exterior and chewy consistency interior**.

The natural reddish colour of the apple pomace rendered it a **reddish-golden hue**, which is appealing to the human eye.

The product contains **moderate levels** of TPC, which is commensurate with its antioxidant activity.

The **use of industry by-products** has the capacity to yield a **final product** that is characterised by **intriguing functional properties**.

References

- Raŕu, R.N. *et al.* (2023) 'Application of Agri-Food By-Products in the Food Industry', *Agriculture*, 13(8), p. 1559. doi: 10.3390/agriculture13081559.
- Mateos-Aparicio, I. and Matias, A. (2019) 'Food industry processing by-products in foods', in Galanakis, C.M. (ed.) *The Role of Alternative and Innovative Food Ingredients and Products in Consumer Wellness*. London: Academic Press, pp. 239–281. doi: 10.1016/B978-0-12-816453-2.00009-7.
- Reguengo, L.M., Salgaço, M.K., Sivieri, K. and Maróstica Júnior, M.R. (2022) 'Agro-industrial by-products: valuable sources of bioactive compounds', *Food Research International*, 152, p. 110871. doi: 10.1016/j.foodres.2021.110871

Acknowledgments

We would like to thank the scientific collaboration of CBQF (UIDB/50016/2020). Rita Vedor acknowledges to Fundação para a Ciência e Tecnologia by a PhD grant (10.54499/2023.00447.BD). The authors are grateful to ALITEC - Alimentos Tecnológicos SA, providing the raw material for the experiments performed for this work, and Tagus Valley for their support in carrying out the project. This work was developed under the framework of project Agenda VAAFOOD - Platform for Valorization, Industrialization and Commercial Innovation for Agri-Food, financed through the Program for Recovery and Resilience (PRR).

