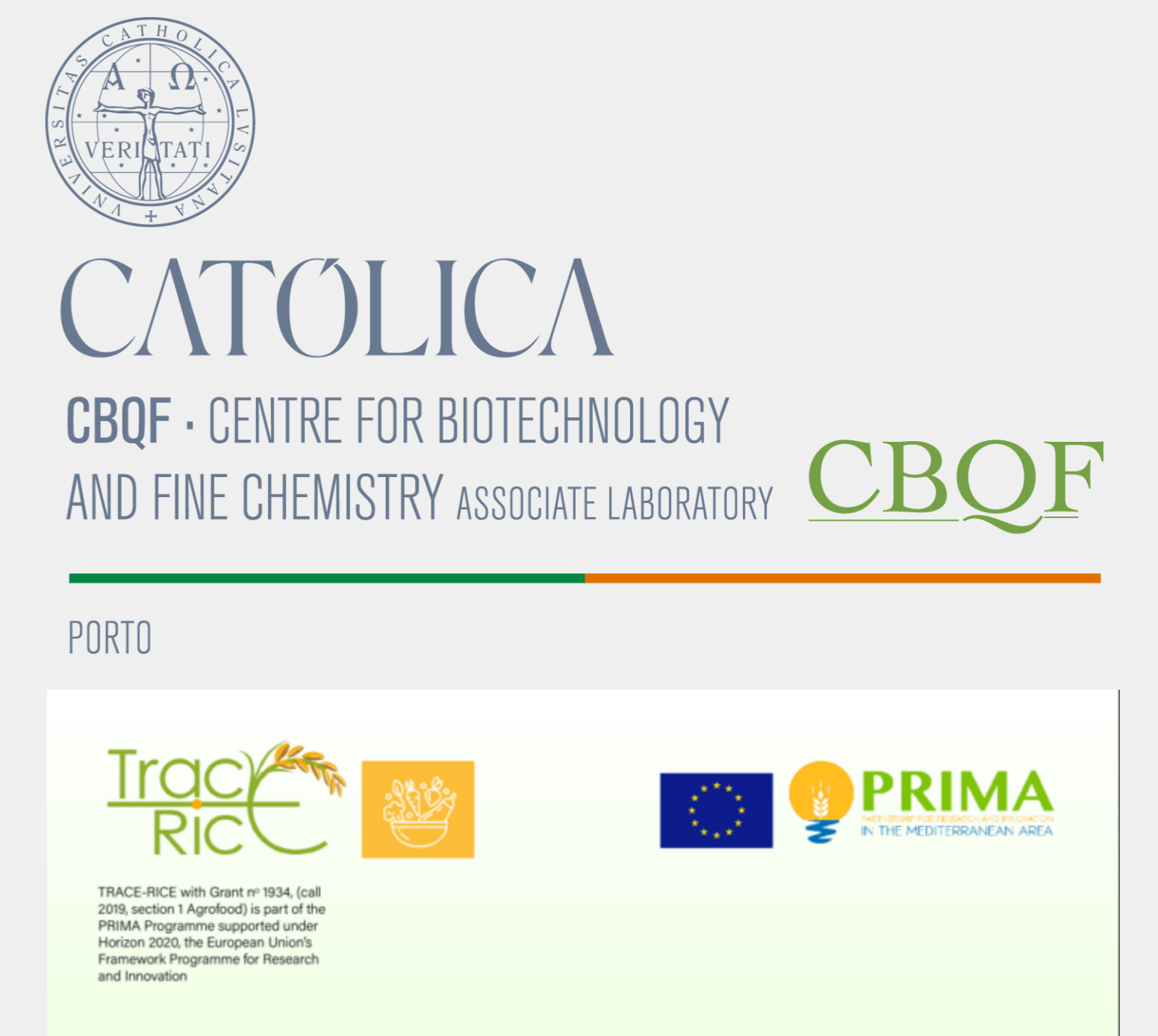


Recovery of functional and bioactive ingredients from lemon by-products: zero waste concept

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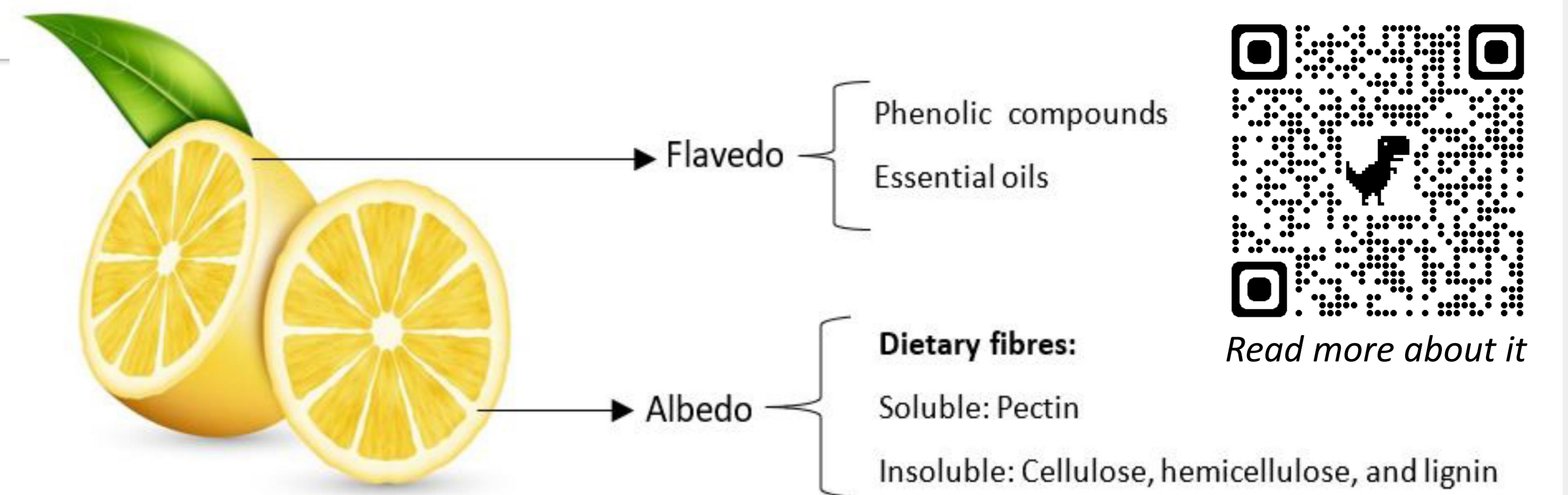
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Introduction

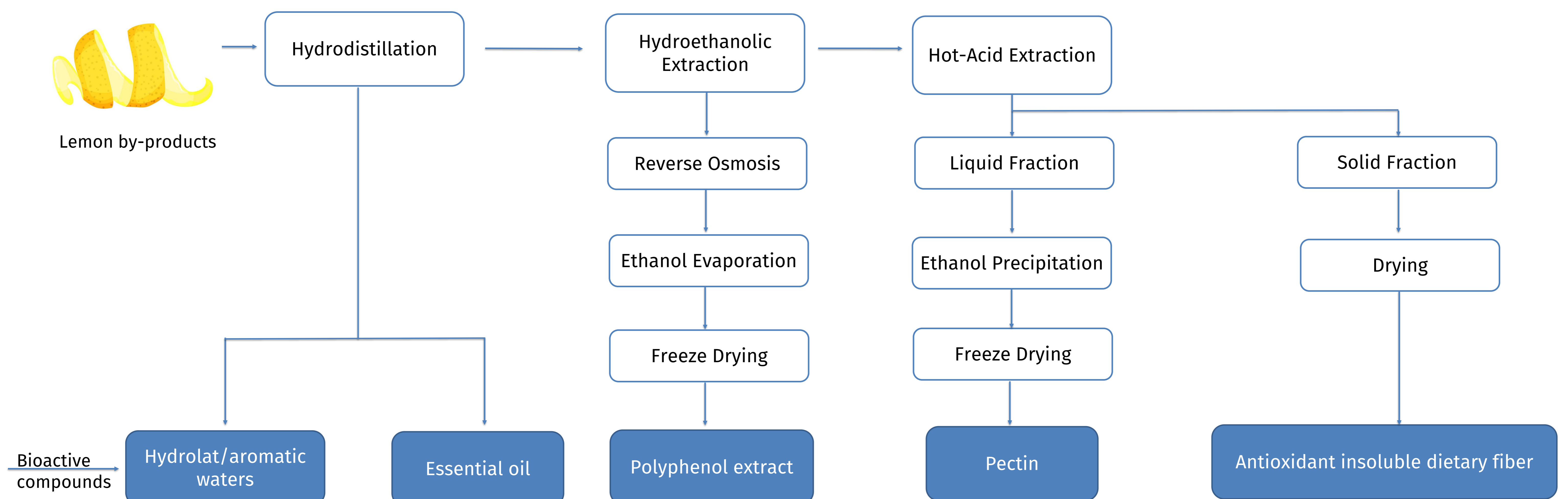
Citrus are one of the most widely cultivated fruit crops and one of the main consumed products in the Mediterranean area. The annual production of different types of citrus fruits was approximately 143 thousand tonnes, where lemons and limes, represented around 20 thousand tonnes, in the year 2019 [1,2]. Industrial processes exploit only the 45% of the total fruit weight, which generates a significant amount of waste, including peel (flavedo: 27%), pulp (albedo and endocarp: 26%) and seeds (2%) [3]. Lemon by-products are composed of significant amounts of bioactive compounds, such as minerals, carotenoids, vitamins, essential oils (EOs), phenolic compounds (PCs), and fibers, which give them bioactivities related to food preservation, such as antimicrobial and antioxidant, and bioactivities related to human health, such as anti-inflammatory, antidiabetic, prebiotic, among others. These by-products can be explored to produce bioactive and functional ingredients, in order to promote the zero waste concept.



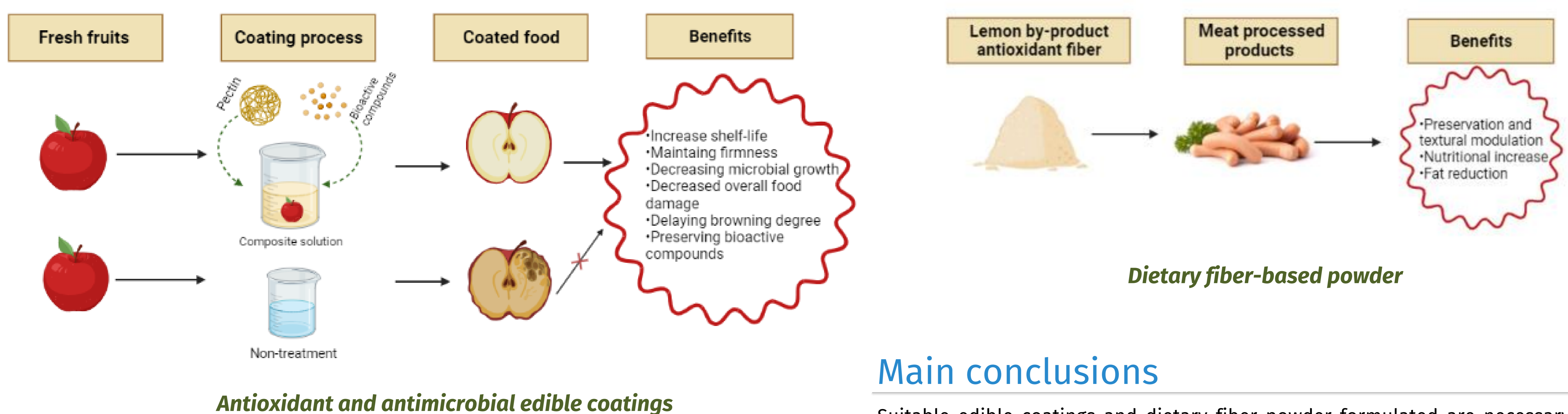
Objectives

In this study, an integrated process was applied to valorize lemon by-products, which are unappealing to customers, from Algarve cultivars (Eureka variety). The application of an integrated process demonstrates the promising circular economy approach and allows the production of several bioactive compounds: hydrolat/aromatic waters, EOs, PCs, pectin and antioxidant insoluble dietary fiber. The recovered bioactive compounds demonstrated the potential to develop solutions for food preservation.

Methods



Applications & Expected Outcomes



Main conclusions

Suitable edible coatings and dietary fiber powder formulated are necessary for a reasonable shelf life and nutritional added value of these food products.

References

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- [3] Magalhães, D.; Vilas-Boas, A.A.; Teixeira, P.; Pintado, M. Functional Ingredients and Additives from Lemon By-Products and Their Applications in Food Preservation: A Review. *Foods* 2023, Vol. 12, Page 1095 2023, 12, 1095, doi:10.3390/FOODS12051095.

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