

New functional syrup obtained from the revalorization with sustainable techniques of the mandarin peel by-product” ECOSYRUP01

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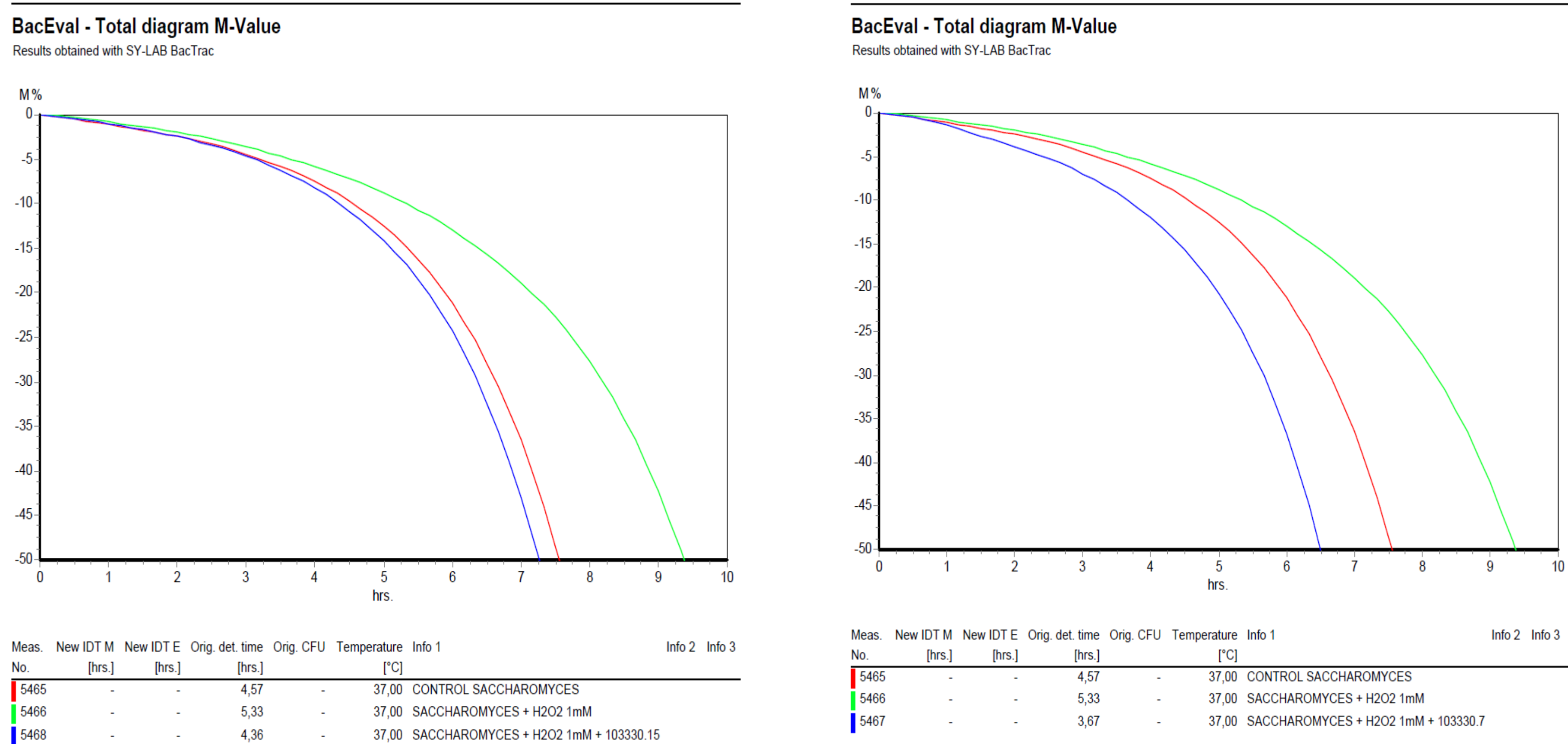


INTRODUCTION

Mandarin peel and non-compliant segments are significant by-products of the citrus industry, often discarded despite its valuable bioactive compounds. These byproducts contain high levels of flavonoids, carotenoids, and other phenolic compounds, which possess antioxidant, anti-inflammatory, and antimicrobial properties. Additionally, they contain natural sugars and organic acids, making them an attractive raw material for the development of functional food ingredients. Given the increasing demand for sustainable solutions in food processing, the revalorization of citrus by-products presents an opportunity to reduce waste while creating high-value products.

OBJECTIVE AND RESULTS

This ECOSYRUP project aimed to develop a process to obtain functional syrups from mandarin peel and discarded segments, leveraging its sugars, antioxidants, and acidifying compounds. By incorporating these bioactive components into a syrup, we can enhance its functional properties while contributing to a circular economy approach in the food industry.



Graph 1. Antioxidant capacity of peel syrupGraph 2. Antioxidant capacity of segments syrup

CONCLUSIONS

- The developed process (figure 1) successfully produced peel syrup and segment syrup with distinct processing parameters tailored to each byproduct. The characterization results (Table 1) indicate that both syrups have a sufficient sugar concentration for use as a covering liquid in canned fruits, with segment syrup exhibiting a high level of organic acids. Additionally, the optimization of Hesperidin and limonene concentrations ensured antioxidant capacity while preventing bitterness in the syrups. Syrups present a sustainable food ingredient alternative with enhanced bioactive properties.
- The antioxidant capacity, as demonstrated by electric impedance measurements (Graph 1 and Graph 2), revealed that yeast growth in both syrups followed a similar pattern to normal yeast growth, whereas oxidation with H₂O₂ significantly delayed yeast development. This confirms the effective antioxidant properties of both syrups.

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ACKNOWLEDGMENTS

This project has been financed within the framework of the Agri-Food PERTE with funds from the Recovery, Transformation and Resilience Plan, financed by the European Union – NextGenerationEU. File number PAG-020200-2023-134.



Picture 1. Mandarin peel and discarded segments

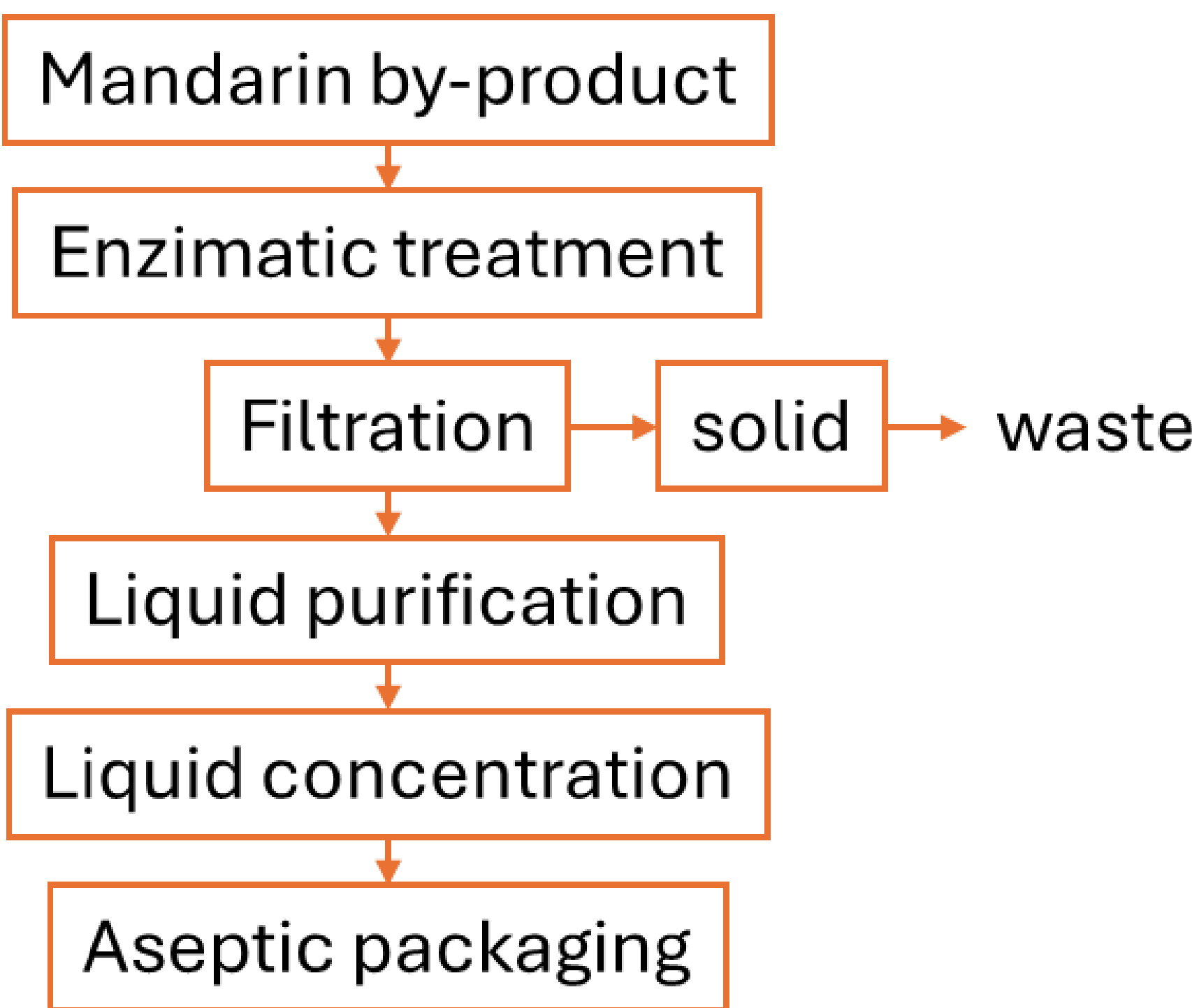


Figure 1. Mandarin peel and discarded segments process

Table 1. Characterization of syrups from mandarin peel and segments		
PARAMETERS	SEGMENTS SYRUP	PEEL SYRUP
HESPERIDIN, mg/kg	64,4	39,4
LIMONIN, mg/L	3,8	1,7
° BRIX (20 °C)	15,5	18,7
TOTAL SUGARS, g/100 g	12,65	18,06
CITRIC ACID, g/kg	5,5	0,9
MALIC ACID, g/kg	1,7	<0,05