A scale-up strategy for the valorization of fruit waste to obtain bioactive compounds suitable for edible coatings development

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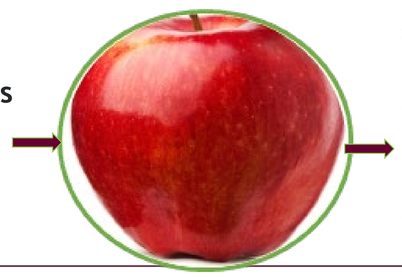
Introduction

Inputs
-Polysaccharides
-Lipids
-Proteins
-Additives



Outputs
- Preserve nutrients
- Regulate gas exchange
- Regulate moisture exchange
- Avoid microbial attack

Scalability Challenges: Poor film adhesion, barrier inconsistency, and unreliable extraction methods limit edible coatings' commercial viability.

Aims and Objectives

Aim: To develop a sustainable, simple process for scaling up edible coatings development using functional extracts from citrus, apple, and grape pomace.

Objectives:
- ✓ Evaluate Fruit Pomace: Assess citrus, apple, and grape pomaces as sources of biopolymers required for formulating edible coatings.
- ✓ Evaluate stability of compounds in NaDES
- ✓ Optimize Green Extraction: (temperature, solid/liquid ratio, time) using RSM for yield and bioactivity.
- ✓ Scale-Up Production: Scale extraction and formulation from 10 ml to 1-liter batches

Methodology

(1) Fruit pomace pre-treatment: drying and grinding → (2) Solid-liquid extraction with NaDES; Optimisation using RSM, CCD → (3) Edible coating formulation - Pectin -Plasticisers -Bioactive compounds → (4) Edible coating application - Apples - Pomegranates

Conclusions

- ✓ Extracts from blended pomaces possess inclusive metabolite profiles with moderate levels of bioactive compounds required to produce functional edible coatings
- ✓ NaDES can stabilise bioactive compounds from oxidative stress
- ✓ The biphasic extraction path produces extracts with the best TPC and RSA
- ✓ The extraction process is scalable from 10 ml to 1000 ml with consistence in viscosity, TPC and RSA

Future studies

- ✓ Optimisation of pomace blending ratios to get required coating properties for specific food applications

Main Results

Fig 1. Metabolomic profiling of fruit pomaces

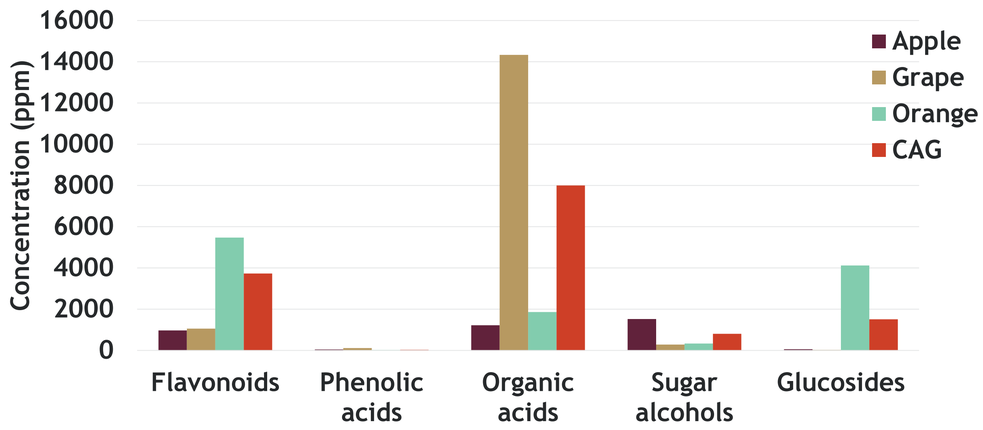


Fig 2. Evaluation of extracts bioactive compound stability

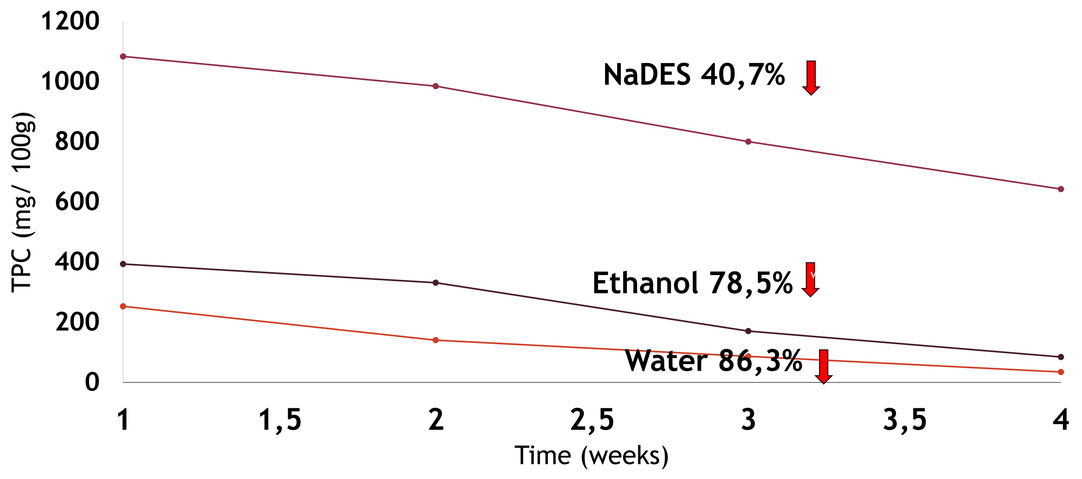


Fig 3. Process developing the extraction process

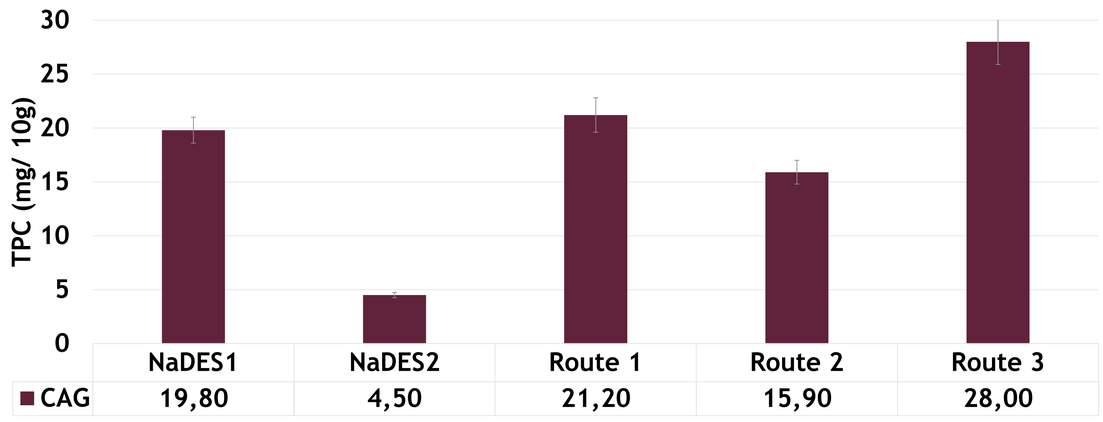
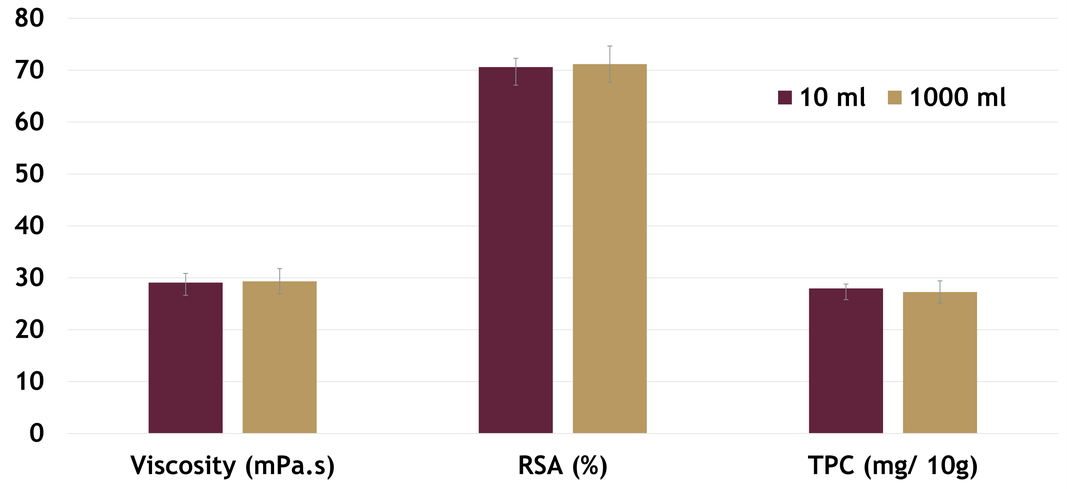


Fig 4. Scale-up process extract physichochemical properties



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