Development and Bioactive Potential of Plant Residue Films Enriched with Eucalyptus Extract and Oregano Essential Oil

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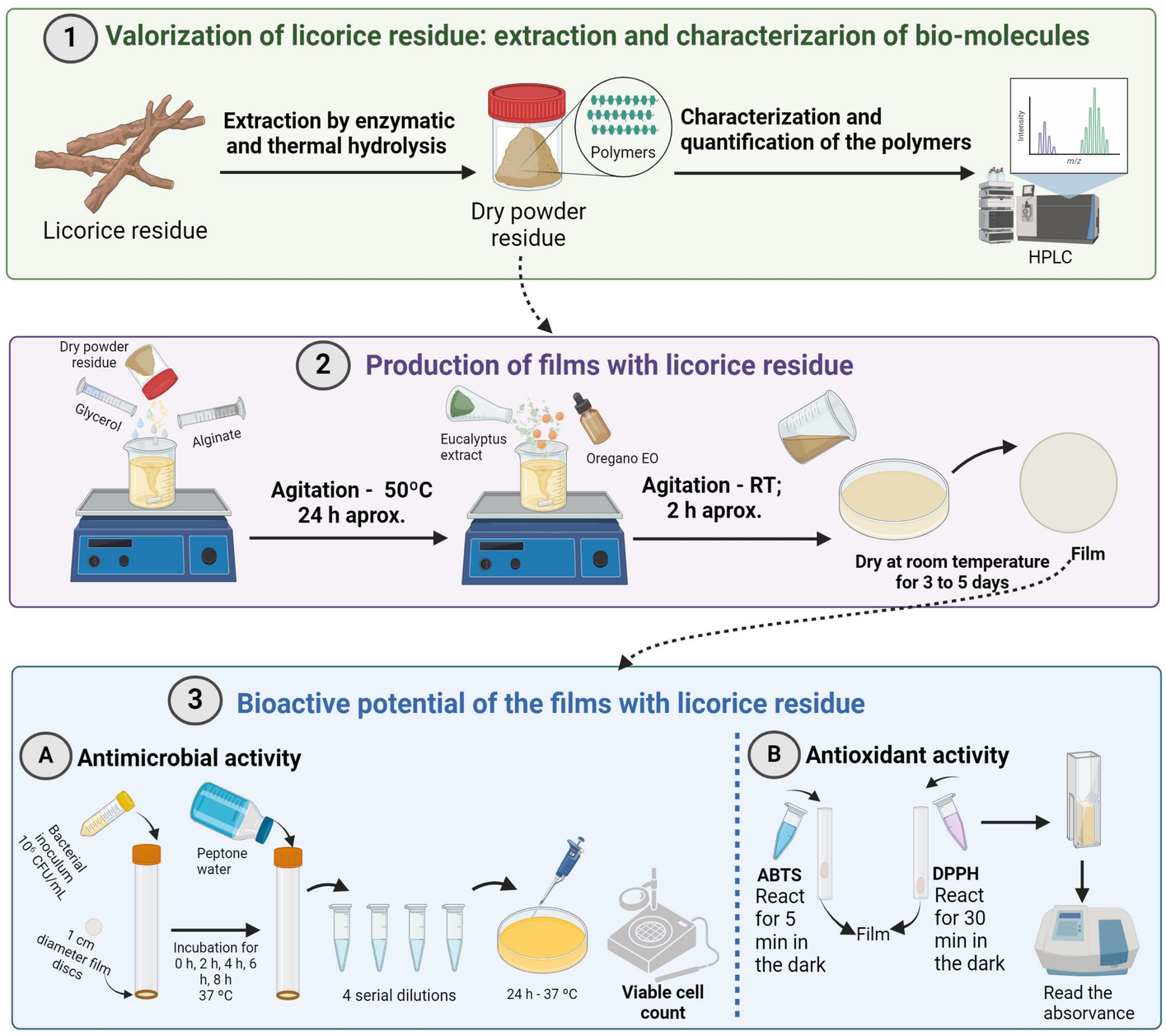
Introduction

Traditional plastic food packaging is typically non-renewable and non-biodegradable [1], creating a need for new eco-friendly and sustainable alternatives, such as plant-based films. Plant agro-industrial wastes, such as peels, stalks and bagasse, have been explored as sources of polymeric matrices in film development [2]. Additionally, natural compounds from plants, like plant extracts (PEs) and essential oils (EOs) can provide these films with antimicrobial and antioxidant activities, conferring them the ability to act as food preservatives against a broad spectrum of food poisoning/contaminants microorganisms and taking the opportunity of their antioxidant properties to avoid the deterioration of fats and other food constituents [3].

Objectives

1) To extract and characterize the bioactive molecules from licorice residues.
2) To produce polymeric films with licorice-based polymers incorporated with eucalyptus extract and oregano EO.
3) To evaluate the antimicrobial and antioxidant activity of the films.

Methodology



Results

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Table 1: Chemical composition of the licorice residue

	Concentration (g/ 100 g)
Moisture	4.92 ± 0.05
Ash	3.57 ± 0.35
Protein	3.20 ± 0.24
Fat	0.05 ± 0.02

Carbohydrates	Concentration (g/ 100 g)
Soluble dietary fiber (SDF)	0.24 ± 0.02
Insoluble dietary fiber (IDF)	73.58 ± 2.15
Cellulose	12.15 ± 0.55
Hemicellulose	25.70 ± 0.86
Lignin Insoluble	33.17 ± 8.49
Lignin soluble	11.02 ± 0.39

The main constituent of the residue is insoluble fibers (approximately 74%,) with lignin being the main constituent (approximately 33%).

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Figure 1: Films with licorice residue

Licorice residue – Control film | Licorice residue + oregano EO (OEO) 1% | Licorice residue + eucalyptus extract (EE) 1% | Licorice residue + OEO 2% + EE 1%

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Figure 2: Antimicrobial activity of the films by viable cells method

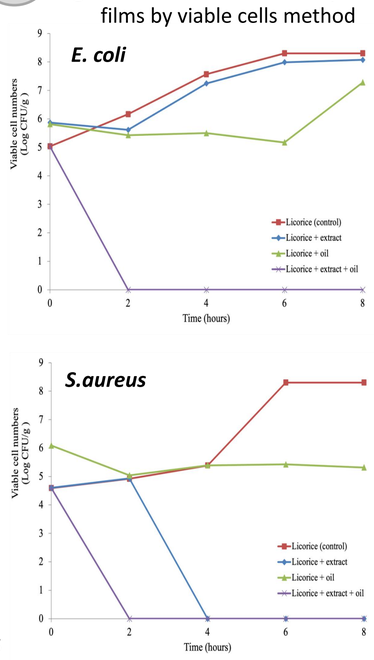
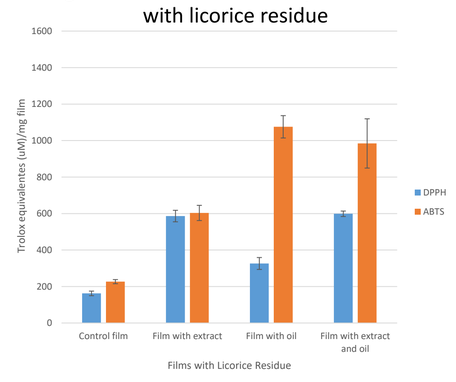


Figure 3: Antioxidant activity of the films with licorice residue



Conclusions

- Licorice residues are rich in insoluble fibers.
- These fibers were used to produce edible films incorporated with oregano EO and eucalyptus extract.
- Licorice residue film incorporated with eucalyptus extract and oregano essential oil inhibited the growth of *S. aureus* and *E. coli* after 2h; the film with eucalyptus extract inhibited *S. aureus* after 4h.
- All films presented antioxidant activity; the film with oregano EO presented higher antioxidant activity by ABTS, whereas the film with oregano EO and eucalyptus extract presented higher antioxidant values by DPPH.

References

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