

Antimicrobial characterization of alginate edible films containing plant extracts



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PORTO

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Introduction

Foodborne diseases outbreaks are a problem that carries negative social and economic impacts [1]. The way in which food is preserved largely contributes to its appearance. So, there is an increasing concern in the development of food packaging that is safe for the consumer, presenting antimicrobial activity against a broad spectrum of food poisoning microorganisms [2].

Edible films can act as complements to traditional plastics because their functional properties are able to extend food shelf-life [3].

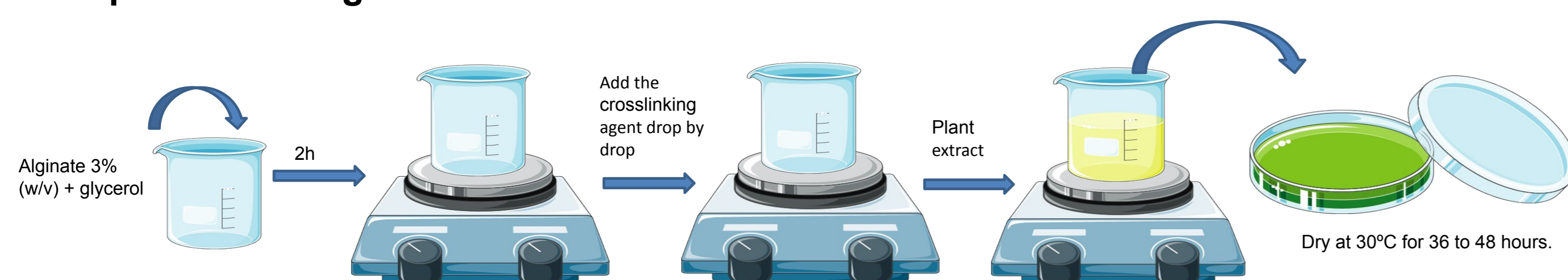
Plant extracts are obtained by natural plants and possess antioxidant and antimicrobial activities. They can be effective at low concentrations, are cost-effective and easy to apply, present low toxicity levels and high stability during processing and do not affect the sensory characteristics of food products [4].

Objectives

In this work, alginate films containing extracts from licorice (*Glycyrrhiza glabra* L.), eucalyptus (*Eucalyptus globulus* Labill.) and sage (*Salvia officinalis* L.) were created. Their antimicrobial activity was determined against Gram positive bacteria *Bacillus cereus* (*B. cereus*), *Listeria monocytogenes* (*L. monocytogenes*) and *Staphylococcus aureus* (*S. aureus*) and Gram negative bacteria *Escherichia coli* (*E. coli*) and *Pseudomonas aeruginosa* (*P. aeruginosa*).

Methods and Results

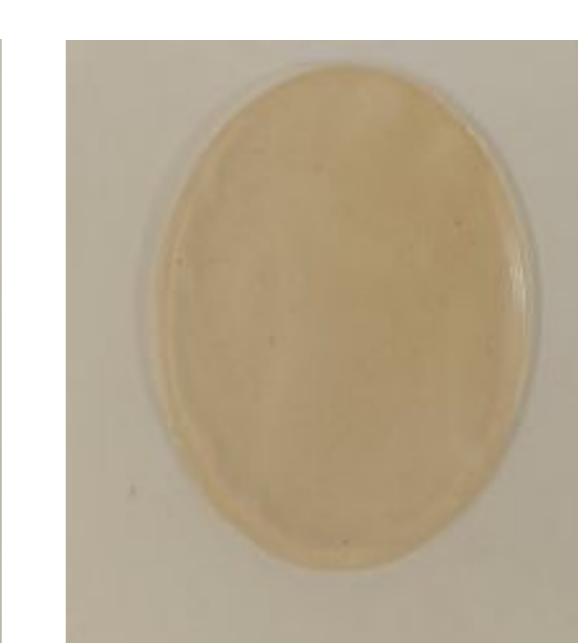
1. Preparation of alginate films



Alginate 3% + TPP (no extract)



Alginate 3% + TPP + eucalyptus



Alginate 3% + TPP + licorice

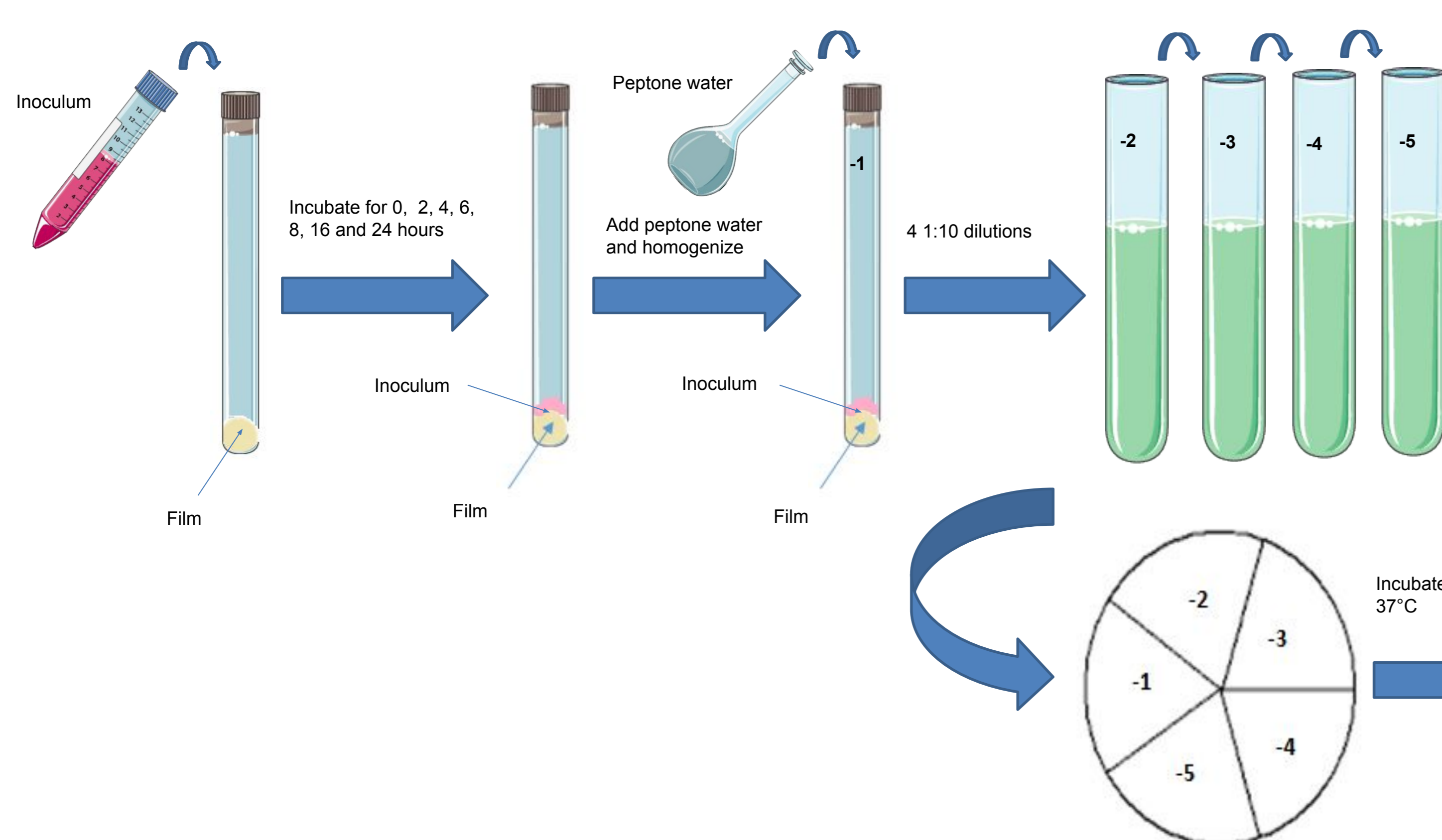


Alginate 3% + TPP + sage

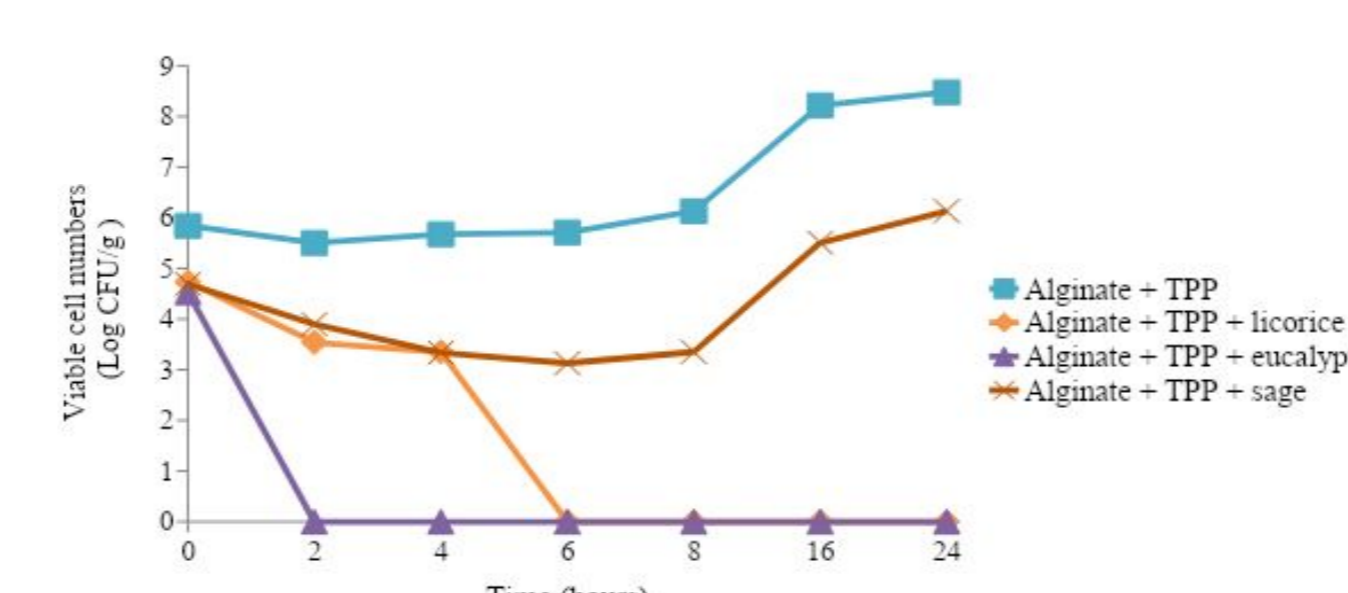
2. Antimicrobial activity of the alginate films by the viable cell count assay method

Before the test:

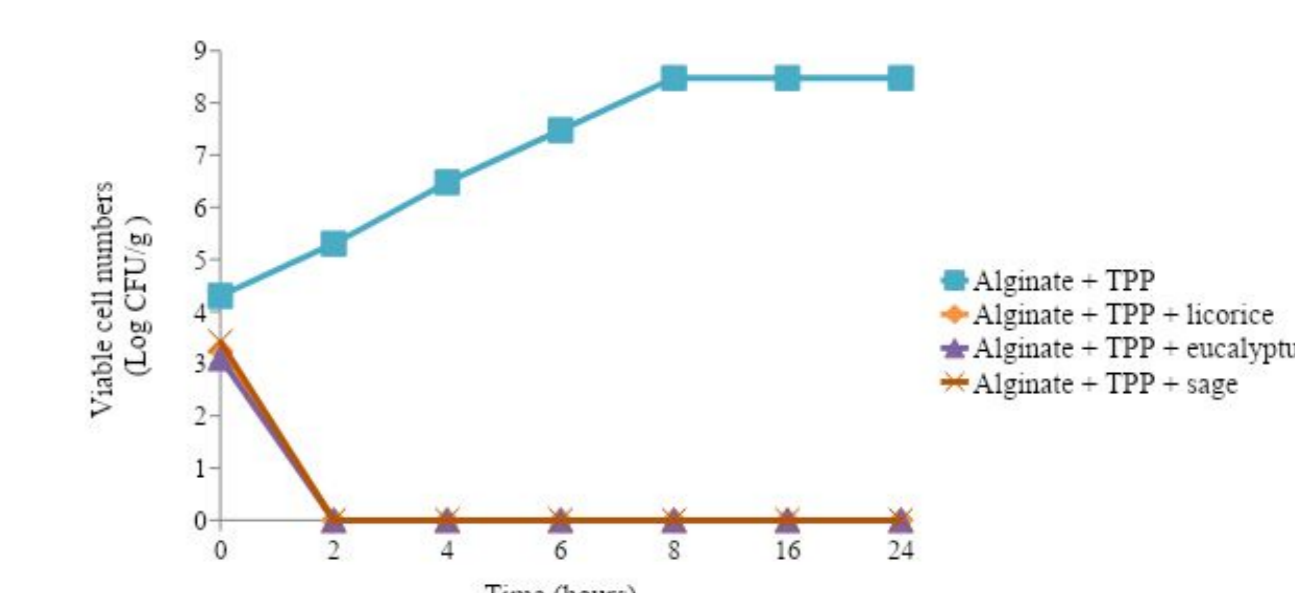
- Cut the films into 1 cm diameter discs.
- Sterilize the film discs with ultraviolet radiation for 10 minutes on each side.
- Prepare a bacterial inoculum at $10^5 - 10^6$ CFU/mL



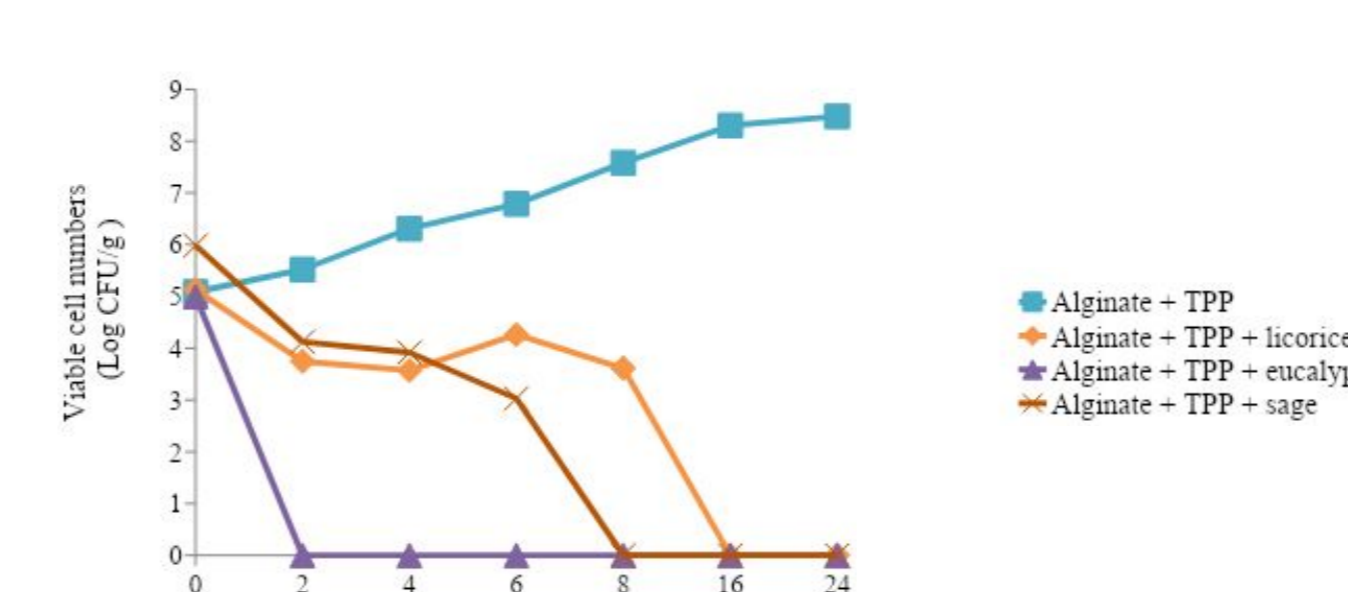
S. aureus



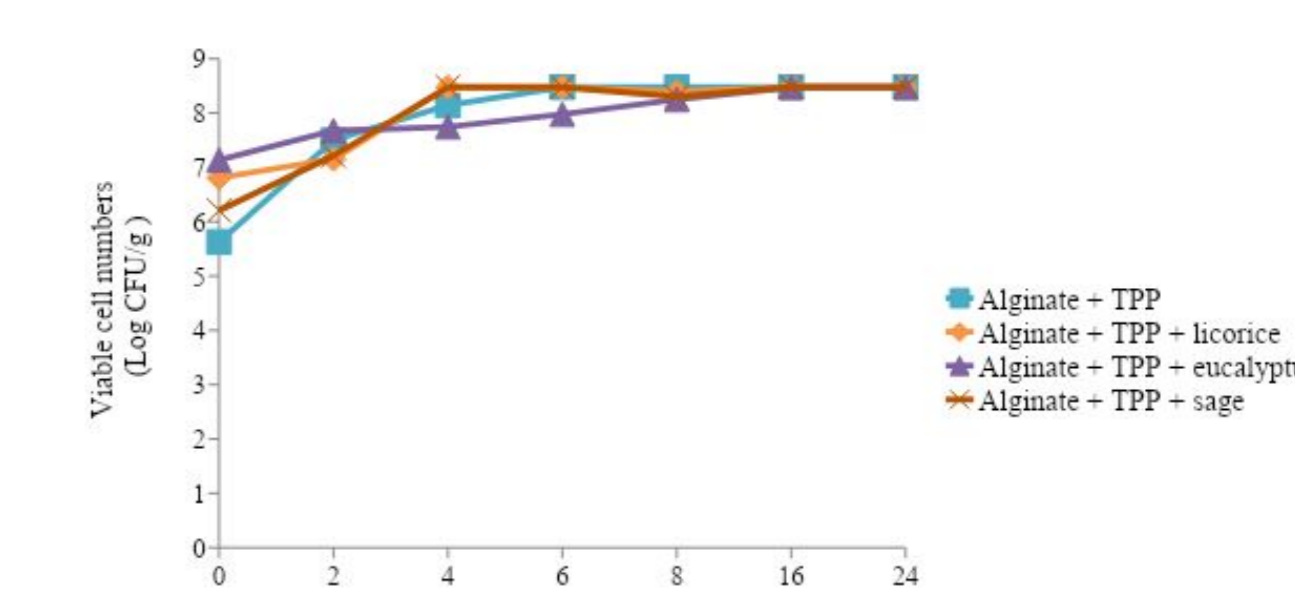
B. cereus



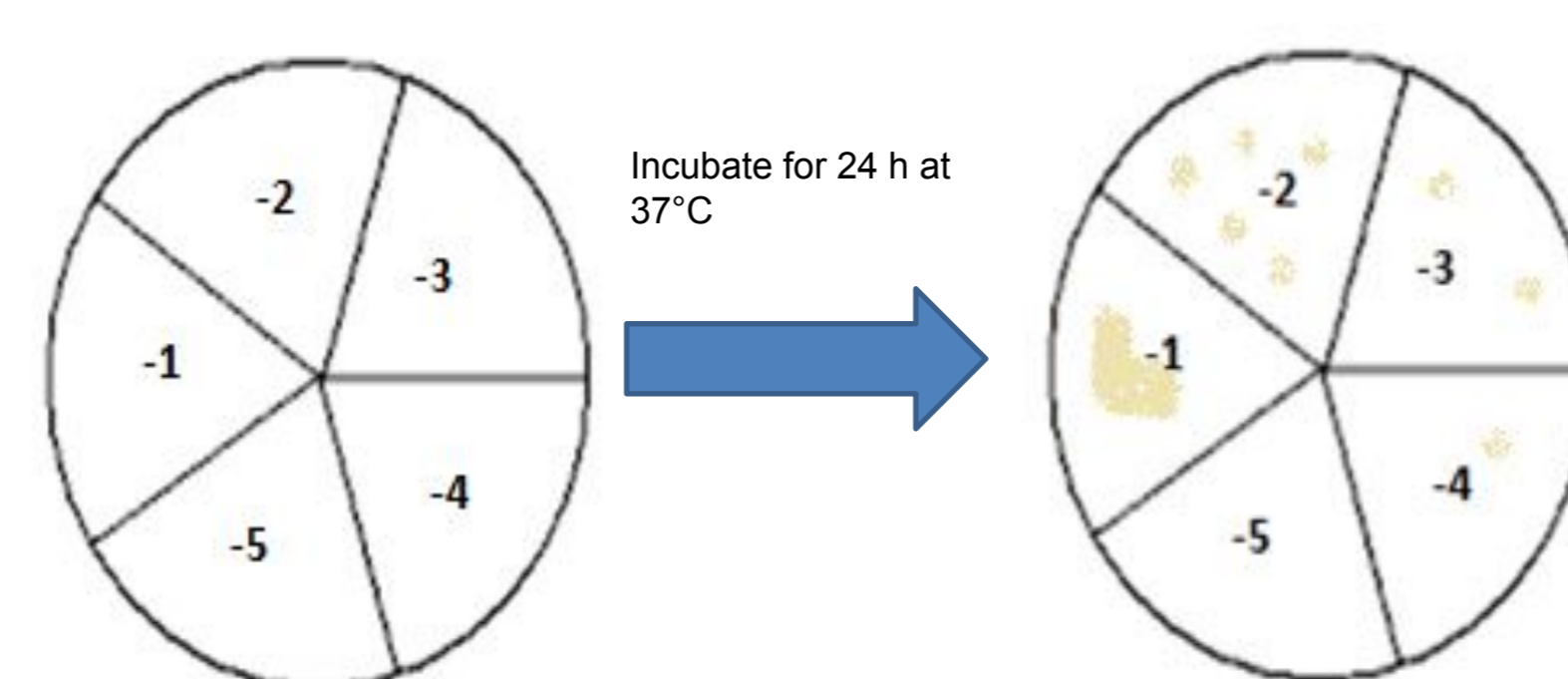
L. monocytogenes



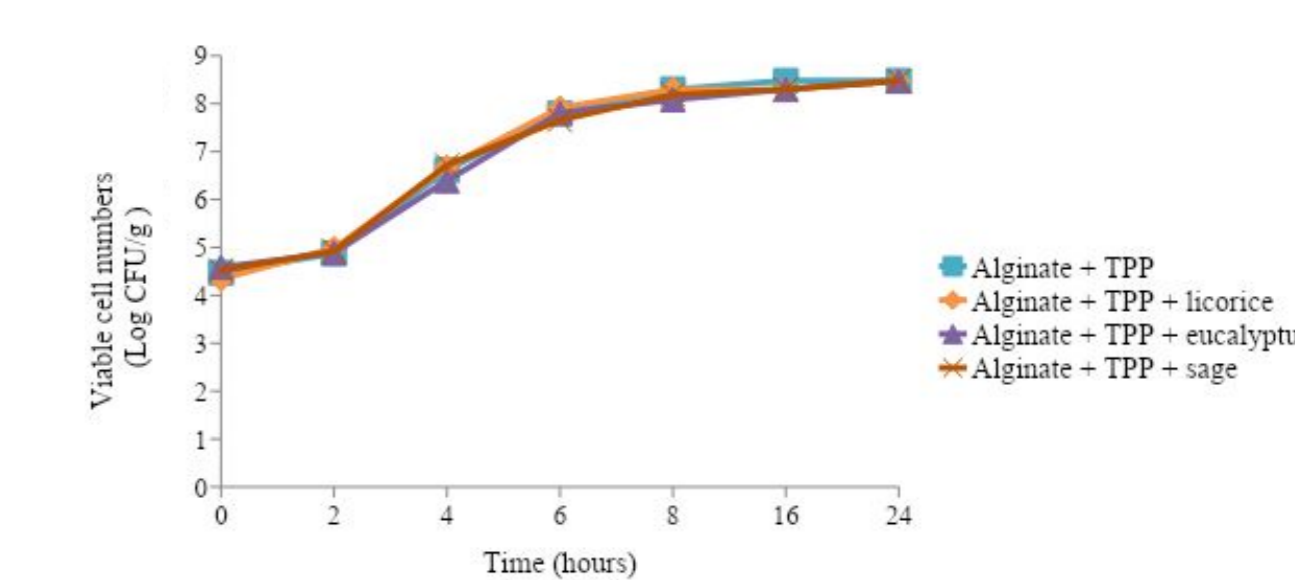
E. coli



Count the colonies



P. aeruginosa



Conclusions

- Films incorporated with eucalyptus and licorice inhibited all Gram-positive bacteria studied.
- The film incorporated with sage extract inhibited the growth of *B. cereus* and *L. monocytogenes* but did not kill *S. aureus*.
- The films showed no antimicrobial activity against Gram-negative bacteria.

References

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2. Freitas, I. R.; Cattelan, M. G., In *Microbial Contamination and Food Degradation*, Vol. 1; Holban, A. M.; Grumezescu, A. M., Eds.; Academic Press, **2018**, pp 443-470.
3. Campos, D.; Piccirillo, C.; Pullar, R. C.; Castro, P. M.; Pintado, M. M., *J. Sci. Food Agric.* **2014**, *94* (10), 2097-103.
4. Liu, T.; Liu, L.; Gong, X.; Chi, F.; Ma, Z., *LWT* **2021**, *135*, 110181.

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