

Combined antimicrobial effect of Essential Oils and other natural products (bacteriocins, chitosan, etc.) against *Listeria monocytogenes* in ready-to-eat seafood



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The consumption of minimally processed ready-to-eat (RTE) or raw foods has affected the incidence of diseases caused by psychrotropic bacteria, such as *Listeria monocytogenes*. Natural substances as bacteriocins and Essential Oils (EOs) are Generally Recognized As Safe (GRAS) by the FDA and have shown an important role in the control of pathogens, with feasible application in various foods. The aim of present study was to isolate and characterize LAB strains from selected seafood in order to demonstrate the ability of some of them to produce bacteriocins. Subsequently, the antibacterial activity of different EOs was investigated, both alone and in combination with bacteriocins to evaluate a possible synergistic effect between various natural products against the pathogen *Listeria monocytogenes*.

Results:

Enterococcus is the best genera endowed with antibacterial activity, as emerged by the **deferred antagonism** assay (data not shown) and the **agar well diffusion** assay shows that bacLP17 is the most active bacteriocin against *L. monocytogenes* among all those tested, with inhibition zone greater than 5mm.



Agar well diffusion:
Bacteriocins bacLP17- against *Listeria monocytogenes* wild type



Agar disk diffusion assay:
Melaleuca alternifolia, *Salvia officinalis* and *Thymus vulgaris* against *Listeria monocytogenes* ATCC 10888

Materials and Method

Enterococcus mundtii LP17



ANTIBACTERIAL ACTIVITY

AGAR WELL DIFFUSION

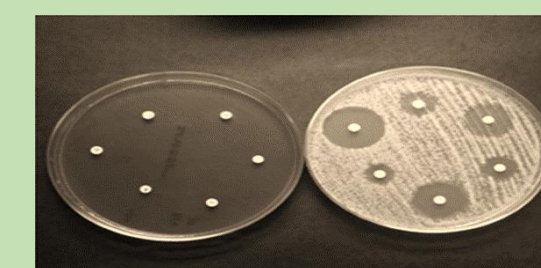
DEFERRED ANTAGONISM



Listeria monocytogenes



Thymus vulgaris



Salvia officinalis

The **agar disk diffusion assay** shows that activity of EOs (*Salvia officinalis*, *Thymus vulgaris* and *Melaleuca alternifolia*) with inhibition zone greater than 10 millimeters.

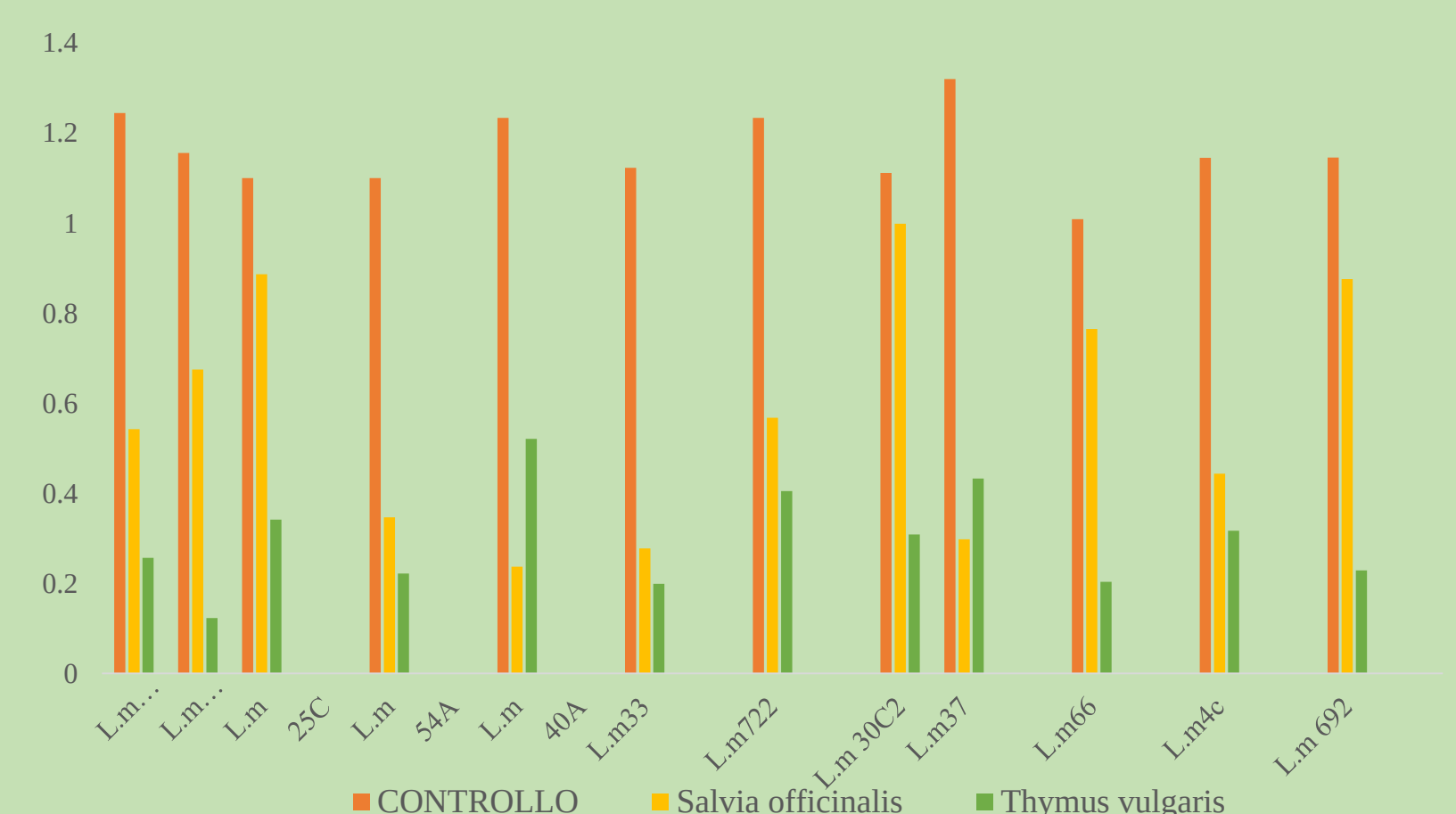
The **Fic-Index** shows an excellent synergy between various EOs and between the EOs and bacteriocin LP17, with values equal to or less than 0.5.

Lastly, *Thymus vulgaris* and *Salvia officinalis* showed antilisterial activity also when the pathogen is organized or inside preformed **biofilm**, with appreciable lower values than the control.

FIC-Index of Thymus vulgaris+ BactLP17



BIOFILM



Conclusion: this study demonstrates the antibacterial potential of *Thymus Vulgaris*, *Salvia Officinalis*, *Melaleuca alternifolia* and bacteriocins, alone and in combination, against *Listeria monocytogenes*, and the possibility of their use in preserving seafood products. Future studies will be performed to evaluate the antibacterial activity against *L. monocytogenes* of other natural products as cherry and blackcurrant polyphenols, chitosan, propolis and nisin, alone and in combination.

References

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