ANTIBACTERIAL AND ANTIBIOFILM EFFECT OF WINTERGREEN AND IMMORTELLE ESSENTIAL OILS AGAINST STAPHYLOCOCCUS AUREUS

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ABSTRACT

Biofilms are highly-structured communities of cells that produce an extracellular matrix and adhere to abiotic or biological surfaces, therefore they can contaminate foods as well. Staphylococcus aureus is a common bacterium with biofilm-producing character. Foods that are not cooked after handling, such as sliced meats, puddings, pastries, and sandwiches, are especially risky if are contaminated with S. aureus [1]. The essential oils (EOs) and their components are becoming increasingly popular as anti-biofilm agents. Gaultheria procumbens L. (wintergreen) and Helichrysum italicum Roth. (immortelle) are aromatic medicinal plants. They are traditionally used as choleretic, diuretic and expectorant and in bacterial infections [2, 3]. These EOs have antibacterial effect, but their anti-biofilm activity has not been proved yet.

GC-MS analysis revealed that the main compound of wintergreen EO was methyl salicylate and the main component of immortelle EO is neryl acetate.

The MIC [Minimum Inhibitory Concentration] was determined with broth macrodilution test (wintergreen: 0.40 mg/mL; immortelle: 0.07 mg/mL) against S. aureus. The bacterial biofilm was created in 96-well microtiter plates. After incubation, the Tween80 solution of the EOs was added to the biofilm in MIC/2 concentration (wintergreen: 0.2 mg/mL, immortelle: 0.03 mg/mL). After a second incubation, the adherent cells were fixed with methanol and stained with 0.1% crystal violet, and dissolved in 33% acetic acid. The absorbance was measured at 595 nm with plate reader.

Our results showed that the wintergreen and immortelle oils have anti-biofilm activity against S. aureus, because the EOs reduced the biomass of the bacterial biofilm. It is important to highlight that the immortelle EO was more effective (inhibitory rate: 69.5%) than the wintergreen oil (inhibitory rate: 58.9%), compared to the control (untreated bacterial biofilm).

In this study, the anti-biofilm effect of wintergreen and immortelle were investigated against S. aureus. We conclude that the biofilm formation of S. aureus was more sensitive to immortelle EO. After toxicological experiment, the application of this oil against food-borne pathogens in food industry might be supposed.

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