Investigation of the antimicrobial activity of the essential oil of *Cymbopogon martini* on *S.aureus* and *E.coli* biofilms

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Biofilms are sessile communities of microbial cells embedded in an exopolymeric secreted matrix that can adhere both to abiotic and living surfaces, serving as a permanent source of contamination. Essential oils (EOs) have different characteristics depending on the plant due to a large number of compounds (eugenol, citral, carvacrol, among others). It has been noticed that EOs have promising antibacterial activity that can be explored as an effective alternative to control biofilms. The aim of this study was to assess the antimicrobial activity of the essential oil of *Cymbopogon martini* against pre-established single biofilms developed by *Staphylococcus aureus* and *Escherichia coli*. Biofilms were developed in 96-well microtiter plates for 24 h at 37 ºC, in an orbital shaker at 120 rpm, being afterwards submitted to EOs aggression for 15, 30 e 60 minutes. The essential oil were dissolved in DMSO (2.0 %) and saline water (0.85 %) with tween 80 (0.5 %) in order to obtain final concentrations of 0,12, 0,48, 0,96 and 1,92 %. Biofilms were characterized, before and after EO treatment, by total biomass, through crystal violet (CV), and number of cultivable bacterial cells, expressed as Log CFU per cm^2.

The *C. martini* essential oil did not have any effective antimicrobial action against *S. aureus* biofilms, since there was no significant reduction of the biofilm cultivable cells and biomass. Conversely, this essential oil showed a promising antimicrobial activity against *E.coli* biofilms as it was observed a significant reduction of the cultivable biofilm-growing cells, in general, for all the concentrations tested and exposure time periods. Similarly to *S.aureus* biofilms, the *C. martinii* essential oil was not effective in reducing the biomass of *E. coli*.

From the data, it can be concluded that under the conditions tested, the *C. martinii* essential oil was more effective in the inhibition of the bacterial cells entrapped in *E. coli* biofilms than in the removal of biofilm mass. This inability to remove biofilm s from surfaces can be a drawback since the viable cells remaining within the biofilms after EOs treatment are protected by the exopolysaccharides matrix, allowing its multiplication. To overcome this situation, it would be interesting to assess the anti-biofilm potential of the *C. martinii* essential oil, as well as its synergistic activity with an antimicrobial agent with biofilm disrupting properties.

Keywords: biofilms, sanitizer, natural antimicrobial, bacteria, essential oil