In vitro single and combined antibacterial effect of *Eucalyptus globulus* and *Pimenta pseudocaryophyllus* essential oils on multi-drug resistant *Enterococcus faecalis* and probiotic *Lactobacillus rhamnosus*.

Carmen M. S. Ambrosio[1], Severino M. de Alencar[1], João V. Coffani-Nunes[2], Eduardo M. da Gloria[1]

[1] Department of Agroindustry, Food and Nutrition-ESALQ- University of São Paulo, SP, Brazil.
[2] Universidade Estadual Paulista "Julio de Mesquita Filho", Campus Registro, SP, Brazil
emgloria@usp.br

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The growing demand of products from poultry and pig meat around the world has demanded an intensification of their production. In this way, antibiotics have been used in the animal nutrition as growth promoters. However, several consequences have arisen of this, principally, the emergence of multi-drug resistant pathogens like *Enterococci* bacteria. Similarly, several *Lactobacillus* species have been used as probiotics in poultry and pig nutrition with the aim to compete against detrimental bacteria and promote the growth. Consequently, studies with essential oils or blends of them have showed their potential as antimicrobial agents. Therefore, the aim of this research was evaluate the effect of single and combined antibacterial effects of *Eucalyptus globulus* and *Pimenta pseudocaryophylllus* essential oils on multi-drug resistant pathogenic bacterium *Enterococcus faecalis* and probiotic bacterium *Lactobacillus rhamnosus*. To evaluate the antibacterial effect of single oils, microdilution method was used to determine the Minimal Inhibitory Concentration (MIC) through two-fold serial dilutions from 14.80 to 0.116 mg/mL. MICs were evaluated by the resazurin test. Minimal Bactericidal Concentration (MBC) was evaluated by plating. The results showed that for *E. globulus* oil the MIC was 14.80 mg/mL for both bacteria, *E. faecalis* and *L. rhamnosus*. To *P. pseudocaryophylllus* oil, was 7.4 mg/mL to *E. faecalis* and 3.7 mg/mL to *L. rhamnosus*. The *E. globulus* oil was bactericidal at 14.8 mg/mL to *E. faecalis* and to *L. rhamnosus* and *P. pseudocaryophyllus* oil was bactericidal at 7.4 mg/mL to *E. faecalis.* The combined antibacterial effect for these two oils was evaluated by the determination of Fractional Inhibitory Concentration (FIC) by resazurin test and by calculation the FIC index values. *E. globulus* oil was ranged from MIC to 1/8 x MIC and *P. pseudocaryophylllus* from 2 x MIC to 1/32 x MIC for *E. faecalis* and *L. rhamnosus*. Two combinations (1/8 x MIC *E. globulus* + MIC *P. pseudocaryophylllus* and MIC *E. globulus* + 1/32 x MIC *P. pseudocaryophylllus*) were inhibitory to *E. faecalis* and FIC index values were 1.125 and 1.035 for the two combinations, respectively. These values indicate an indifferent (non-interactive) effect of these two oils to *E. faecalis*. The combination conformed by 1/2 x MIC *E. globulus* + 1/2 x MIC *P. pseudocaryophylllus* was inhibitory to *L. rhamnosus* and the FIC index value was 1.0 indicating an additive effect of these essential oils. Hence, these results showed that it was not possible to find a synergic effect to combat the pathogenic bacteria *E. faecalis*. On the other hand, the results obtained to single *E. globulus* oil showed a selective effect on the probiotic bacterium *L. rhamnosus*, although it was inhibitory to this bacterium, it was not bactericidal to it, compared with *E. faecalis.*

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