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Essential oils composition, antibacterial and antioxidant activities of hydrodistillated extract of *Eucalyptus globulus* fruits

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ABSTRACT

Aromatic plants and their essential oils have been used since antiquity in flavor and fragrances, as condiments or spices, in medicines, as antimicrobial/insecticidal agents, and to protect stored products. The present study was undertaken: to determine (:) the chemical composition of essential oils extract from *Eucalyptus globulus* (*E. globulus*) fruits, using Gas-Chromatography coupled with Mass Spectrometry (GC/MS) method, to examine their antioxidant activity (DPPH', reducing power and lipid peroxidation inhibition assays) compared to that of Butylated hydroxyanisole (BHA) standard, and to estimate their antibacterial effects against reference pathogenic strains: *Staphylococcus aureus* (*S. aureus*), *Bacillus subtilis* (*B. subtilis*), *Listeria innocua* (*L. innocua*), *Escherichia coli* (*E. coli*), *Pseudomonas aerugenosa* (*P. aerugenosa*), compared to that of two antibiotics (tetracycline and gentamicin). Twenty eight volatile compounds were identified, with the predominance of sesquiterpenes and oxygenated sesquiterpenes compounds (61.2%). The results of the antioxidant activities (DPPH scavenging activity, reducing power and inhibition of lipid peroxidation activity) of essential oils extract revealed weak activities with IC_{50} values of 27.0 ± 0.2 mg mL^{-1}, 32.9 ± 1.8 mg mL^{-1} and 4.9 ± 0.2 mg mL^{-1}, respectively; as compared to those of Butylated hydroxyanisole (BHA) standard that were about 0.05 ± 0.0 mg mL^{-1}, 0.03 ± 0.0 mg mL^{-1} and 0.5 ± 0.2 mg mL^{-1}, respectively. The antibacterial activity shows an inhibition effect of essential oils extracts against all the tested bacteria with MIC of 3 and 4 mg mL^{-1}. A bactericidal effect is observed, with MBC varying between 3.6 and 9.0 mg mL^{-1}, which demonstrates the sensibility of all tested bacteria to the essential oils of *E. globulus* fruits.

1. Introduction

In the light of scientific development, the medicinal properties of plants have reached a great interest, due to their pharmacological activities, low toxicity and economic viability (Auddy et al., 2003). These studies have focused on the benefits of phytochemicals extracted from plants and their impact on human health. Natural additives from plants can be compounds, groups of compounds or essential oils. More recently, food industry's interest in natural compounds for direct addition or to be used in synergy with other compounds has been increasing. Several studies report direct addition of aromatic plants essential oils and extracts to foodstuffs to exert an antimicrobial or antioxidant effect (Costa et al., 2015).

Among natural compounds, essential oils from aromatic and medicinal plants have shown biological activities and receive particular attention due to their radical scavenging properties (de Sousa Barros et al., 2015). Herbal substances are used against free radicals which are related to several pathologies such as cancer and neurodegenerative diseases. They are also involved in the deterioration of the organoleptic and hygienic quality of food (Hale et al., 2008).

Another problem affecting public health is the emergence of antibiotic resistance, following their massive use (De Billerbeck, 2007). This led to the strong demand of consumer for new antibiotics against pathogens (Fisher and Phillips, 2008) and has

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