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Bioactive components of *Eucalyptus camaldulensis*, a potential alternative bio-preservative against foodborne *Listeria monocytogenes*

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The increasing consumers' skepticism towards available synthetic chemical antimicrobial preservatives and emergence of resistant strains of spoilage and foodborne microorganisms, spurs the search for potent alternative food grade antimicrobials. The present study investigated the antimicrobial and antivirulence activities of ethanolic extract of *Eucalyptus camaldulensis* and its effects on the cell membrane of the foodborne pathogen, Listeria monocytogenes. The antimicrobial activities, investigated using the disc diffusion and micro-dilution techniques revealed that the extract had an antilisterial effect with a MIC and MBC of 0.064-0.128 and 0.256-0.512mg/mL respectively. MIC values for $NaNO_2$ and sodium benzoate were 8-32 and 32-64mg/mL respectively and the MBC values were consistently greater than 128mg/mL. The time-kill assay revealed a 3-log reduction in CFU/mL for strain F2365 and other tested isolates at a concentration of 4MIC. Inhibitory and sub-inhibitory concentrations, of the extract, disrupted flagella formation as shown in the reduction in motility from 100% to lower than 60%. MIC values completely inhibited listeriolysin O activity with a 10-fold reduction at 1/2MIC and 1/4MIC for isolate PSU-KV-118 and 1/2MIC for F2365 respectively. At 1/2MIC and 1/4MIC, the extract significantly inhibited biofilm formation at ($P<0.05$). BATH assay revealed that the extract interfered with cell surface hydrophobicity, and in addition disrupted membrane permeability of strain F2365 after 30 min contact time as demonstrated by the crystal violet uptake assay. The results revealed that the extract exhibited antimicrobial, anti-virulence and membrane alteration effects on *L. monocytogenes* and thus, might serve as a potential alternative source of antimicrobial compounds suitable for the control of *L Monocytogenes*. Hence, it might be explored for an alternative source of potential antimicrobial preservatives.

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