21142 | Plant products as resistance-modifying agents to recycle old antibiotics

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Abstract

In recent decades, the escalating trend of multidrug-resistant bacteria has posed a severe threat to global public health by limiting therapeutic options and increasing mortality rates [1, 2]. Consequently, novel treatment strategies have been under exploitation, being plant-derived compounds, i.e., phytochemicals, an emerging promise to face this challenging issue as they offer a panoply of advantages - from structural diversity and multiple modes of action to safety [3, 4]. In this study, five phytochemicals (linalool, verbenone, chrysin, crocin, and papaverine) were used to assess their antimicrobial activity and then their potentiation effect on ten antibiotics from different classes (ciprofloxacin, methicillin, oxacillin, amoxicillin, erythromycin, gentamicin sulfate, tobramycin, tetracycline, fusidic acid, and mupirocin). The minimum inhibitory concentrations (MIC) and minimum bactericidal concentrations (MBC) of all phytochemicals were determined against *Escherichia coli* CECT 102 and *Staphylococcus epidermidis* ATCC 35984 using the microdilution assay. Linalool exhibited promising results, with MIC and MBC values of 800 µg/mL for *E. coli* and a MIC of 400 µg/mL for *S. epidermidis*. Similarly, verbenone showed significant potential with a MIC of 2000 µg/mL for both bacteria. The remaining compounds showed MIC and MBC values exceeding 2000 µg/mL. Moreover, to initially appraise the synergistic effects between the phytochemicals and antibiotics, the disc diffusion method was used, and results revealed a clear potentiation effect for verbenone, linalool, crocin and chrysin when combined with erythromycin. These molecules when combined as natural deep eutectic solvents further demonstrated promising effects against the bacteria in planktonic state and biofilms. To date, this study has revealed promising results, supporting phytochemicals as agents capable of modifying resistance and their great prospect in combating this pressing global predicament.

Keywords: antimicrobial resistance; bacteria; phytochemicals; synergy; natural deep eutectic solvents.

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