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Characterization of antimicrobial cellulose acetate films incorporated with geranyl acetate ester

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Cellulose acetate (CA) is emerging as a promising alternative to obtain biomaterials to several purposes, highlight in biomedical area where CA membranes have been studied to improve the osseointegration after implantations, in tissue engineering, wound dressing, hemodialysis process and to control the drug delivery. Another hard trend is the development of active food packaging, a special kind of system that can play an active role in food quality where CA films widely used. For both biomedical and food packaging actuation the antimicrobial feature of CA materials is very desirable. In this context, antimicrobial CA films were obtained by the incorporation of 0.5% and 1.0% (v/v) of geranyl acetate ester (GA) through the casting technique. GA is an ester with excellent antimicrobial properties, thermal stability and low toxicity which makes it interesting to be incorporated in CA polymer base, replacing conventional metallic particles and volatile essential oils. This new material was evaluated for its antibacterial e antifungal activity against gram-positive bacterium Staphylococcus aureus, gram-negative bacterium Escherichia coli and fungal Aspergillus flavus and the chemical, thermal e mechanic characterizations of films also were performed. The 0.5%GA films presented antibacterial activity against S. aureus bacterium with inhibition halo of 17.7 ± 0.6 mm while to 1.0%GA the inhibition zone was 27.3 ± 0.6 mm which make it possible to associate the antimicrobial feature of films due the ester presence. For E. coli bacterium no inhibition zone was detected which can be explained by the greater resistance of gram-negative bacteria if compared to gram-positive ones. The antimicrobial films also were able to reduce fungal growth, especially 1.0%GA which allows only traces of microbial growth in its surface, filling less than 10% of plate. This way, the antimicrobial feature of films has been proved. The incorporation of GA in the polymeric films was confirmed by FTIR and TGA technique while DSC analysis suggested the compatibility between GA and CA. Mechanical behavior of CA film was not modified with the GA incorporation and even that results for elastic modulus and tensile strength showed dispersion, all the values seems to be compatible to CA membranes. All this results accredit the new material to future applications in biomedical devices and food packaging.