Antimicrobial effects of mesoporous nanoparticles loaded with grape seed extract on Escherichia coli

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Research and development on new drugs extent natural resources as a systematic way having strategic and economic value has currently become important all over the world. Plant extracts are inexpensive, accessible and natural resources that can be used in various industries to prevent the growth of pathogenic bacteria. E. coli and S. aureus are among the most important microbial agents involved in food poisoning and gastrointestinal infections. The aim of this study was to investigate the antimicrobial effects of mesoporous nanoparticles loaded with grape seed extract on E. coli and S. aureus. In this study, mesoporous SBA-15 nanoparticles were used as a platform to load a large amount of extract and also its gradual diffusion in the target site. The microdilution method was performed to determine the minimum inhibitory concentration (MIC) and minimum bactericidal concentration (MBC) of extract encapsulated in mesoporous silica nanoparticles compared with those in the free form of the drug against strains of Staphylococcus aureus ATCC1113 and Escherichia coli ATCC2592 in vitro. The findings suggested that the antimicrobial effect of the encapsulated form of grape seed extract in mesoporous silica nanoparticles was conducted gradually with regard to the gradual release rate of grape seed extract the studied nanoparticle, and also the MIC and MBC. Therefore, the microbial zone inhibition diameter has gradually increased during 24 to 72 hours. As a result, the full release took up to 72 hours, and it is justified that the bacteria were subject to the extract in the longer time. Considering the antimicrobial effects grape seed extract on gram-negative bacterium, E.coli, as well as gram-positive bacterium, S.aureus, it is concluded that due to the extract's antimicrobial properties, it can be used in the pharmaceutical and food industries extensively, and pharmaceutical nanocarrier systems such as mesoporous silica containing extract would be utilized as a novel pharmaceutical system following performing further studies.

Keywords : Key Words: Mesoporous Silica Nano Particle, SBA-15, Grape Seed Extract, E.coli, S. aureus, MIC, MBC