Abstract

Introduction and aim: Nowadays, Solid lipid nanoparticles have drawn much interest as an alternative carrier to conventional colloids for they can facilitate the delivery and improve the control of the release kinetics of active compounds. Nigella Sativa, commonly known as black seed, is a species of the Ranunculaceae family majorly native to southwest Asia. Black seed oil (BSO) and its extracts have several properties including antimicrobial activity. In this regard, *S. aureus* as a gram positive bacteria is a human pathogen whose infections caused by this bacterium include endocarditis, skin and soft tissue infections, bacteremia, sepsis and etc. This bacteria of current universal importance represents a main carrier of re-emerging antimicrobial resistance to the currently available antibiotics. Thus, our study centered on enhancing the antimicrobial activity of BSO against *S. aureus* by nano-encapsulating in solid lipid nanoparticles.

Material and method: In this research, SLNs containing black seed oil were prepared using double emulsification technique, incorporating BSO, PVA, tween80, lecithin, cholesterol and dichloromethane as ingredients. Developed SLNs were evaluated for encapsulation efficacy, drug loading percentage, particle size, polydispersity index and zeta potential. Imaging of nanoparticles was done with TEM method, and the release pattern of nanoparticles in-vitro was investigated using a dialysis bag through a 72-hour procedure. Eventually, broth microdilution method was used to evaluate antimicrobial activity of BSO-SLN measuring MIC and MBC compared to pure oil.

Results: Based on the mentioned method, BSO-SLNs were developed. The encapsulation efficiency percentage was 73.22% and the cumulative release rate within 72 hours was %71. The particle size was reported 196.4 nm and the zeta potential was recorded -28.9 mV. The MIC of pure oil and BSO-SLN were determined 480 and 200 μg/Ml, and the MBC had a concentration of 1560 and 830 μg/Ml, respectively.

Conclusion: By comparing the MIC and MBC ranges, it was found that the inclusion of SLN boosts pure BSO antimicrobial activity against S. aureus. Thereupone, it may be concluded that the discussed nanoparticles can target the release of Nigella sativa to enhance the delivery and its antibacterial potential.

Key words: Nigella sativa/ Black seed oil/ Solid lipid nanoparticle/ Double emulsification technique/ S. aureus.