One-pot synthesis of agglomeration-free alloyed nanoparticles with excellent antibacterial activity

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Abstract: Nanoparticles derived from plants have recently attracted the interest of scientists due to their nontoxic and benign nature compared to chemically prepared nanoparticles. Green silver nanoparticles are renowned for their inherent bactericidal properties, but the issue of agglomeration prevents them from being utilized to their fullest potential. In this study, ultrasonic wave-assisted bimetallic nanoparticles are synthesized with the Indian medicinal plant by the one-pot method. Phytochemical analysis and colorimetric test of the extract have confirmed the presence of stabilizing and capping agents such as flavonoids, polyphenols, and alkaloids in the selected plant. This research aims to develop alloyed X/Y nanoparticles of antimicrobial potential to anticipate synergistic antimicrobial activity. The primary advantage of the method is the reduction in the cytotoxic effect of chemical-reducing agent utilization and giving agglomeration-free nanoparticles. Furthermore, the combined mode of bimetallic (say X/Y) nanoparticles with plant extract will enable novel modes of dual action against the resistant bacteria compared to conventional antibiotics. Characterization of alloyed X/Y nanoparticles has revealed the polydisperse nanoparticles of spherical morphology, with size ranges of 25-40nm. EDX has also validated the presence of bimetallic composition of X by 45% and Y 11%. To determine the activity of prepared NP, *S aureus* was tested and found to exhibit a 64.67% inhibition rate compared to control i.e., commercially purchased nanoparticles. Prevalent microbiota found at the site of infection as *P.aeruginosa* will also be tested against bimetallic nanoparticle synergistic activity formulation. The dose-dependent study will be performed to provide the formulated antimicrobial range of activity and efficiency.

Keywords: Bimetallic agglomeration free nanoparticle, Plant extract, Green method, Synergistic Antimicrobial activity