

Evaluation of Anti-microbial and Anti-biofilm Activities of *Syzygium Cumini* (L.) Skeels Mediated Gold Nanoflowers (Au NFs) against Multidrug Resistant Microbes

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Abstract—As compared to chemical or physical methods, biological techniques are not only cost effective but also make the NPs more biocompatible. In this work, we have synthesized gold nanoflowers (Au NFs) using aqueous seed extract of *Syzygium cumini* (L.) Skeels and explored its anti-efflux and anti-biofilm potential against multidrug resistant (MDR) microorganisms. The colour change to red wine from yellow and corresponding UV peak at 526 nm indicated the formation of AuNFs. The phases identified as (111), (200), (220) and (311) in the XRD analysis (JCPDS card no. 04-0784) reflected the FCC structure of the crystal. The SAED pattern was consistent with crystalline nature of synthesized NFs. The XPS spectra of the NPs are typical for Au (0) state with the 4f peak deconvoluted into 4f7/2 and 4f5/2 peaks with binding energies of 84.0-84.4 and 87.7-88.2 eV respectively. Au NFs showed better antimicrobial activities against test microorganisms as compared to discrete Au NPs (starch free). The MIC value was found to be 0.06 mM and MBC value of Au NFs against MDR was found to be 0.14 mM. The significant decrease of protein and exo-saccharides in biofilm mass validated its antibiofilm activity at 0.5mM. The intercalation of EtBr to DNA increased the fluorescence at 0.15mM of Au NFs and hence proved the blockage of efflux pumps. The MIC and MBC values of Au NFs were found far less than that of FDA approved oral dosage for Au NP based medicines, which make it a potential drug candidate.

Graphical Abstract

