ABSTRACT

The World Health Organization has declared antibiotic resistance as a global alarming issue and the nanotechnology has the potential in developing innovative antimicrobial drugs. In the present study, chloroform (CHL), diethyl ether (DEE) and ethyl acetate (EA) extracts of five culturable endophytic bacteria (*viz.*, *Acinetobacter baumannii*, *Bacillus subtilis*, *Enterobacter hormaechei*, *Klebsiella pneumoniae*, and *Pantoea ananatis*) were studied for evaluating their phytochemical content, antioxidant properties, presence of metal ions and secondary metabolites. Total phenolic content (μg GAE/mg) and total flavonoid content (μg RE/mg) were found within the range from 1451.67 ± 27.54 (EA extract of *K. pneumoniae*) to 54.44 ± 5.36 (CHL extract of *A. baumannii*), and 615.00 ± 30.05 (EA extract of *A. baumannii*) to 12.22 ± 9.62 (CHL extract of *B. subtilis*), respectively. Total antioxidant capacity (μg AAE/mg), and percentage inhibition of DPPH radical scavenging activity and ferrous ion chelating activity were found within the range from 761.32 ± 5.99 (EA extract of *E. hormaechei*) to 175.71 ± 7.05 (CHL extract of *E. hormaechei*), 21.99 ± 0.21 (EA extract of *P. ananatis*) to -5.37 ± 0.28 (CHL extract of *A. baumannii*) at 1 mg/mL concentration, and -21.89 ± 0.221 (CHL extract of *A. baumannii*) to 98.00 ± 0.18 (EA extract of *B. subtilis*) at 2.5 mg/mL concentration, respectively. Both the species and solvent dependent variations in the measured phytochemical contents and antioxidant properties were observed. A range of metal ions was found in the endophytes, and the presence of Fe^{2+} and Cu^{2+} were apprehended to affect the antioxidant properties. GC-MS study for the EA extracts of the endophytic bacteria showed the presence of numerous secondary metabolites, and phenolics and other hydroxyl group containing compounds were believed to exert antioxidant properties of the extracts. In addition, sunlight-mediated silver nanoparticles (AgNPs) were synthesized using the endophytic bacteria, and characterized using UV-Vis spectroscopy, FTIR, TEM, SEM-EDX and Zeta potential. The synthesized AgNPs were mainly spherical in shape and polydispersed with the size range of 8.06 to 93.80 nm. The synthesized AgNPs exhibited antimicrobial property against five pathogenic microbes (*viz.*, *Bacillus cereus* (ATCC 10876), *Candida albicans* (ATCC 10231), *Escherichia coli* (ATCC 10536), *Pseudomonas aeruginosa* (ATCC 10145), and *Staphylococcus aureus* subsp. *aureus* (ATCC 11632)) at 6 μg/disc concentration, and four multidrug resistant microbes (*viz.*, *Streptococcus pneumoniae* (ATCC 700677), *Enterococcus faecium* (ATCC 700221), *S. aureus* subsp. *aureus* (ATCC 33592), and *Escherichia coli* (NCTC 13351)) at 10 μg/disc concentration. The results from the present study clearly indicate that the endophytic bacteria are the good source of both

natural antioxidant and pro-oxidant compounds which are dose-dependent. Furthermore, the endophytic bacteria are the promising biomaterials for facile, eco-friendly and green synthesis of AgNPs. The synthesized AgNPs are effective antimicrobial agents against both pathogenic and MDR microbes. However, further *in vivo* and pharmacological studies are highly warranted to evaluate the efficacy of the endophytic bacteria for using them as the novel source of natural antioxidants, and for the efficacy of AgNPs synthesis to produce innovative antimicrobial agents.