ABSTRACT

Catheter associated urinary tract infections (CAUTIs) are most common nosocomial infections affecting people of all ages. Almost 150 million people around the world are affected annually with CAUTIs. The current study was designed to isolate and characterize the bacterial strains from infected catheters and to evaluate the antibacterial, antibiofilm and biofilm inhibitory activity of two medicinal plants viz., *Terminalia arjuna* and *Ipomea carnea* methanolic extract. Six strains were isolated from catheters and identified as *Klebsiella* sp. (OK561619), *Enterobacter* sp. (OK561620), *Klebsiella* sp. (OK561621), *Enterococcus* sp. (OK561622), *K. aerogenes* (OK561623) and *Escherichia coli* (OK561624) via 16S rRNA gene sequencing following morphological and biochemical characterization. Later methanolic extracts of *T. arjuna* and *I. carnea* were prepared using Soxhlet apparatus. Disc diffusion method was used for evaluation of isolated bacterial strains resistance against four antibiotics *i.e.*, lincomycin (100 μgmL^{-1}), erythromycin (20 μgmL^{-1}), rifampicin (100 μgmL^{-1}), and ciprofloxacin (40 μgmL^{-1}). *K. aerogenes* was resistant against all antibiotics except ciprofloxacin. Antibacterial activity of methanolic extracts of *T. arjuna* and *I. carnea* was determined using agar well diffusion method. Statistically significant concentration dependent increase in ZOI ($p < 0.05$) was observed using combination (1:1) of *T. arjuna* and *I. carnea* and it was observed that maximum ZOI (24.0 mm) was measured against *Klebsiella* sp. at concentration of 100 μgmL^{-1}. The biofilm forming ability of mono-species isolated bacterial strains was checked in borosilicate (BS) glass tubes using crystal violet assay at 3,5 and 7 days at 37°C. Out of six, two strains (*Klebsiella* sp. and *Enterococcus* sp.) were able to form strong biofilm on catheter after 3 day of incubation, three strains (*Enterobacter* sp. *Klebsiella* sp. and *E. coli*) formed strong biofilm after 5 days of incubation period and one strain (*K. aerogenes*) formed strong biofilm after 7 days ($p< 0.05$). Percent disruption of preformed biofilm on catheter was observed using methanolic extracts of *T. arjuna* and *I. carnea* alone and in combination against

isolated strains. Highest percent antibiofilm activity was observed against *Klebsiella* sp. (90.1 ± 0.01. $p < 0.05$) at 2 x MIC using methanolic extracts of *T. arjuna* in combination (1:1) with *I. carnea*. Statistically significant concentration dependent increase ($p < 0.05$) was also observed in percent biofilm inhibition using methanolic extracts of *T. arjuna, I. carnea* alone and in combination against isolated strains. *K. aerogenes* was inhibited up to 93.1% at 2 x MIC by using methanolic extracts of *T. arjuna* and *I. carnea* in combination. 2 x MIC showed highly significant ($p < 0.00$) antibiofilm activity and percent biofilm inhibition by all isolated strains. It was observed that potential of both plants was highest when used in combination and increased with increased in concentration. It was concluded that highest concentrations of *T. arjuna* and *I. carnea* showed more efficacy as compared to lower concentration of plant extracts. Methanolic extract of *T. arjuna & I. carnea* when used in combination showed maximum antibacterial, antibiofilm and biofilm inhibitory as compared to methanolic extract of *T. arjuna & I. carnea* when used alone against isolated strains. It was also concluded that both plant extracts (*T. arjuna* and *I. carnea*) showed effective results against CAUTIs.