

Characterization of bacteriocin and chitinase producing bacterial isolates with broad-spectrum antimicrobial activities

ABSTRACT

There is a need for more efficient and eco-friendly approaches to overcome increasing microbial infections. Bacteriocins and chitinases from *Bacillus* spp. can be powerful alternatives to conventional antibiotics and antifungal drugs, respectively. The purpose of this study was to assess the inhibitory potential of bacteriocins and chitinase enzymes against multiple resistant bacterial and fungal pathogens. Bacterial isolates were selected by growth on minimal salts medium and after that were morphologically and biochemically characterized. The physiochemical characterization of bacteriocins was carried out. The inhibitory potential of bacteriocins towards six pathogenic bacteria was determined by the well diffusion assay while chitinase activity towards three fungal strains was determined by the dual plate culture assay. Two bacterial strains (WW2P1 and WRE4P2), out of nine showed inhibition of *K. pneumoniae*, *P. aeruginosa*, *E. coli* and MRSA while WW4P2 was positive against *S. typhimurium* and *E. coli* and WRE10P2 against *P. aeruginosa*, *S. pneumoniae*. Two bacterial isolates (WW3P1 and WRE10P2) were chosen for further study on the basis of their antifungal activities. Of these, WW3P1 isolate was more effective against *A. fumigatus* as well as *A. niger*. The proteinaceous nature of the bacteriocins was confirmed by treatment of the crude extract with proteinase K. It was found that the inhibitory activity of strain WW3P1 against *E. coli* was highest at 20 °C, and against *S. pneumoniae* it was at 20 °C and pH 10 after treatment with EDTA. Inhibition by strain the WRE10P2 against *P. aeruginosa* was highest at 20 °C and pH 14. It was found that EDTA increased the inhibitory activity of strain WW2P1 against *P. aeruginosa*, *K. pneumoniae* and *E. coli* by 2 ± 0.235 , 3.5 ± 0.288 , 2.5 ± 1.040 times, respectively, of strain WRE4P2 against *P. aeruginosa* and *E. coli* by 2.5 ± 0.763 , 2.7 ± 0.5 times, respectively, and of strain WRE10P2 against *S. pneumoniae* by 3 ± 0.6236 times. The isolates have promising inhibitory activity, which should be further analyzed for the commercial production of antimicrobials.