ABSTRACT

Generally, antibiotics production relies on glucose or lactose as carbon and energy source. Alternatively, available raw materials such as agro-wastes have been used successfully as substrates in growth of micro-fungi. The growth of different fungi has been shown to differ with various substrates used. Therefore, there is need to select suitable agro-waste substrates for a given fungus. Moreover, natural fungi can be isolated from dumpsite soils instead of using a standard-fungi in production of antibiotics. To achieve efficient production of antibiotics, optimum growth conditions of specific fungi need to be determined. The objectives of this study were to isolate and characterise secondary metabolites produced by *Acremonium* spp from dumpsite soils, optimising the growth conditions suitable for the production of the cephalosporin and determine its antibacterial properties *in-vitro*. Isolation of *Acremonium* spp was done by spread plate method on potato dextrose agar treated with vancomycin to inhibit any bacterial growth. *Acremonium* spp colonies were characterised using their macroscopic and microscopic features. Response Surface Methodology was used to determine the optimal growth conditions (temperature, pH and substrates). Growth conditions of *Acremonium spp* were optimised using three levels of each input variables (temperatures range of 25^0 C, 28^0 C and 31^0 C; pH of 5.5, 6.5 and 7.5; substrates (wheat bran and corn cob, and glucose and lactose used as control). The antibacterial activity of the chloroform-extract was tested *in-vitro* against three bacterial strains; *Escherichia coli* ATCC 25922, *Salmonella typhi* ATCC 6539 and *Staphylococcus aureus* ATCC 25923. Data was collected on optimal growth conditions, yield of mycelia biomass and zones of inhibition. Data collected were subjected to one-way ANOVA to determine significant variation between treatments (levels of pH, temperature and substrates) on mycelial biomass yield and, antibacterial activity of the chloroform-extract using SAS version 9.4. Significant means were separated using LSD at $\alpha = 0.05$. This study revealed that serial dilutions of 10^2 and 10^3 were suitable for the isolation of the fungus. The findings of this study revealed that treatments had significant ($p < 0.05$) effect on mycelia biomass yield. Generally, corn cob gave the highest mycelia biomass yield, while lactose gave the lowest yield. Corn cob yielded a mycelia biomass ranging from 0.90 g – 2.45 g while wheat bran yielded mycelia biomass ranging from 0.64 g – 1.77 g. The results of this study revealed that, the optimal growth conditions for *Acremonium* spp when using wheat bran as a substrate are, a pH of 7.32, temperature 28.24 ^{0} C and 5.88 g of wheat bran, while, using corn cob as a substrate are, a pH of 7.6, temperature 28.36 ^{0} C and 5.66 g of corn cob per 50 ml fermentative media. Using the optimum growth conditions, 629.69 mg/L and 559.68 mg/L amount of cephalosporin for crude and purified extract, respectively, was achieved. *In-vitro* antibacterial activity of the chloroform-extract at 6 mg/ml, 12 mg/ml and 18 mg/ml tested against *E. coli*, *S. typhi* and *S. aureus* showed zones of inhibition. TE, AMP, GEN, S, SX, COT NIT and NA were used as the positive controls while chloroform was used as the negative control to confirm sterility of the paper discs used. The study also revealed that some of the positive controls (TE, COT and SX) on *E. coli* gave significantly higher zones of inhibition than chloroform-extract at 6 mg/ml. Resistance to AMP was observed in all the bacterial strains. The study concluded that it is possible to isolate native *Acremonium* spp from dumpsite soils and optimisation of fungi growth conditions result to high yield of cephalosporin. The study recommends bioprocessing industries to consider utilising agricultural wastes as source of growth substrates in production of cephalosporin. This will not only curb environmental pollution but also bio-converse wastes into wealth and provide alternative cost-effective substrates for production of cephalosporin antibiotics.