ABSTRACT

The increased prevalence of bacterial infections has been a major challenge to human with devastating high mortality and morbidity rates. This situation has been worsened by increasing antibiotic resistant strains of pathogenic bacteria, reduced effectiveness of antibiotics in the market, and the emergence of new bacterial infections. This study aimed at identification of antibacterial *Actinomycetes* species using biochemical and molecular methods, screening for their antibacterial secondary metabolite and determination of effect of pH, fructose, sucrose, urea and sodium nitrate on their antibacterial activities. The experiments for this study was laid out in Complete Randomized Design and replicated thrice to determine the difference between the inhibition zones (mm) of isolates against the tests organisms and effects of different levels of pH, sucrose and fructose on antbacterial properties of isolates. The resultant data (zones of inhibition in millmetres) was analysed using One Way Analysis of Variance and Kruskal Wallis test in SAS version 9.4. A total of six antibiotic producing *Actinomycetes* species were isolated from river Tana and lake Elementaita and identified through morphological, biochemical and molecular methods.There was a significant ($p<0.05$) different antibacterial activity of *Actinomycetes* isolates against *Staphylococcus aureus, Salmonella typhi* and *Escherichia coli*. The thin layer chromatography profiling for secondary metabolites in extracts revealed a total of 13 different spots with each having a unique retardation factor. The GC-MS analysis of the extracts revealed 140 different metabolites which have been documented to have antibacterial properties from the six *Actinomycetes* isolates. There was a significant ($p<0.05$) effects of different levels of pH and concentration of fructose, urea and sodium nitrate on the antibacterial activity of *Actinomycetes* isolates against *Escherichia coli*. The study has revealed different secondary metabolites in unique combinations across the six *Actinomycetes* isolates with antibacterial activities against *Staphylococcus aureus, Salmonella typhi* and *Escherichia coli.* The findings of this study can help in developing new or alternative antibiotics that can be used for treatment of pathogenic and resistant bacteria.