

**BIOPROSPECTING AND CHARACTERIZATION OF *Streptomyces* SPECIES
ASSOCIATED WITH TERMITES IN KIANG'ODU SECTION OF MOUNT
KENYA FOREST FOR ANTIMICROBIAL POTENTIAL**

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CHUKA UNIVERSITY

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DECLARATION AND RECOMMENDATION

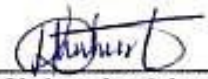
Declaration

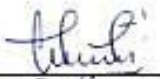
This thesis is my original work and has not been presented for an award of a diploma or degree in any other University.

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Recommendation

This thesis has been examined, passed and submitted with our approval as the University supervisors

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DEDICATION

This thesis is dedicated to everyone who dare to dream and persist in all storms. I dedicate this thesis to my family for their unrelenting love and support that has been my cornerstone throughout this journey. Specially, I dedicate this thesis to my mom, Mrs. Susan Mugira, whose prayers have sustained me, and words of counsel guided me. Thank you for your incomparable love, endless counsel, and belief in me even when I doubted myself. This accomplishment is as much yours as it mine

Lastly, I dedicate this thesis to my dad, Mr. Stephen Mugira whose sacrifices are of incalculable value. This is to honour your what you occasionally tell me, “*the hard way the only way.*”

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ABSTRACT

Antimicrobial resistance poses a major challenge to public health, necessitating the search for novel bioactive compounds from unexplored sources. This study aimed to characterize *Streptomyces* species from the gut of termites inhabiting mounds in a section of Mt. Kenya forest and evaluate their antibacterial activity against multidrug-resistant pathogens: *Enterococcus faecium*, *Staphylococcus aureus*, *Klebsiella pneumoniae*, *Acinetobacter baumannii*, *Pseudomonas aeruginosa*, and *Enterobacter cloacae*-ESKAPE. Twenty-five pure *Streptomyces* isolates were identified based on morphological and biochemical traits, including Gram positivity and spore type. Primary screening was done using the cross-streak method, and secondary screening using the agar well diffusion technique. Data on primary screening was analysed using ANOVA to assess differences among termites from various tree trunks. Secondary screening data, expressed as zones of inhibition (mm), underwent ANOVA with Bonferroni adjustments to compare isolates and pathogens. GC-MS-identified compound abundances per *Streptomyces* isolate were organized into a matrix (isolates $\times$ compounds), averaging duplicate entries. Hierarchical clustering using Euclidean distances and complete linkage quantified isolate similarities, visualized via dendrograms. All statistical and clustering analyses were conducted in R Studio version 4.2.2 at $\alpha = 0.05$ using relevant packages. Results showed strongest antibacterial activity against *S. aureus* (e.g., isolates MTG-04 and MTG-09 with 14.00 mm inhibition zones, $p < 0.0001$), moderate activity against *K. pneumoniae* (MTG-11, 11.17 mm) and *E. cloacae* (MTG-04, 11.33 mm), and lower yet notable effects against *A. baumannii* (up to 9.33 mm) and *P. aeruginosa* (up to 10.83 mm). Secondary screening of crude extracts confirmed these trends, with isolate MTM-18 producing the largest zone against *E. cloacae* (15.00 mm, $p < 0.05$) and strong inhibition against *K. pneumoniae* (14.00 mm). GC-MS profiling identified a diverse range of bioactive metabolites, including fatty acid amides, triterpenoids, and esters, linked to antimicrobial and antioxidant activities. *Streptomyces* from termite guts in Kiang'onde section of Mt. Kenya forest demonstrate promising antibacterial activity primarily against Gram-positive bacteria, with select isolates (MTG-04, MTM-18) identified as prime candidates for further characterization to optimize bioactive compound production and therapeutic potential.