

(076)

**Antimicrobial Properties of Mycelium Based Leather Producing Fungal Species Against Bacterial and Fungal Isolated from Leather Products**

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**Abstract**

Leather is an expensive material with high susceptibility to microbial biodeterioration. Mycelium Based Leather (MBL) is a green alternative to animal-based leather. This study investigates fungal species with pre-evaluated potential to produce MBL, as a green alternative for inhibiting microorganisms isolated from deteriorating leather products. Cotton swab method isolated 5 fungal and 4 bacterial colonies from three leather products with visible microbial growth. Morphological and biochemical characteristics of the pure cultures were evaluated using Gram and Lacto Phenol Cotton Blue staining, microscopic imaging and Urease, Catalase and Cellulase tests. The antimicrobial efficacy of two MBL producing fungal species (T-1 and T-2) were evaluated against 4 bacterial (Suggestive Genera: *Neisseria*, *Micrococcus*, *Staphylococcus* and *Acinetobacter*) and 2 selected fungal species (Suggestive Genera: *Penicillium* and *Geotrichum*). Agar plugs method and dual culture assay were carried out to evaluate antibacterial and antifungal potential of T-1 and T-2. Chloramphenicol and Clotrimazole were used as the positive controls for anti-bacterial and anti-fungal assays, respectively. All tests were carried out in triplicates and statistical analysis was done using R software version 4.2.2. T-1 species demonstrated significant anti-bacterial effects against all 4 bacterial species with the highest average zone of inhibition ( $1.58 \pm 0.02$  cm) against S5C1B (*Micrococcus spp.*) colony and showed significant anti-fungal activity with an average inhibition percentage of  $58.84 \pm 3.3\%$  against S5C2F (*Geotrichum spp.*) colony ( $p < 0.05$ ). Conversely, T-2 species did not show any significant antimicrobial activity against any of the tested colonies ( $p > 0.05$ ). The results of the study are suggestive of T-1 species as an excellent candidate for MBL production as it carries significant antimicrobial activities, which may contribute in excluding synthetic, hazardous, and expensive anti-microbial agents in mycelium culturing stages and post-material processing in mycelium-based leather industry.

**Keywords:** *Mycelium based leather, Anti-fungal, Anti-bacterial, Biomaterial*