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ÁREA DO TRABALHO: MICROBIOLOGIA DO SOLO

TÍTULO DO TRABALHO: Isolation And Characterization Of Amazonian Soil Bacteria With Potential Antimicrobial Activity

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RESUMO:

Amazonian soils represent one of the largest reservoirs of microbial diversity on the planet, acting as a promising source of microorganisms that produce bioactive compounds with potential applications in agriculture and human health. This study aimed to isolate and characterize cultivable soil bacteria from the Rio Negro Sustainable Development Reserve, covering 18 distinct sampling points within a geographic area bounded by the coordinates -60.67, -3.09 and -60.63, -3.08. The objective was to identify bacteria with antimicrobial properties, including both antibacterial and antifungal activity. The isolation of bacteria was performed on conventional Tryptic Soy Agar (TSA) and pasteurized TSA (80 °C for 10 min), a method used to favor the recovery of spore-forming microorganisms, such as actinobacteria and species of the genus Bacillus. The characterization of the isolates involved Gram staining and antimicrobial profiling. The in vitro antibacterial potential of the isolates was evaluated using the co-culture method. Plates were inoculated with a standardized suspension of the pathogens Pseudomonas aeruginosa and Staphylococcus aureus (100 µL; OD600 = 0.5), followed by inoculation with the isolates (10 µL). The presence of inhibition halos was considered indicative of antibacterial activity. Finally, antifungal activity was determined by a direct confrontation assay against Penicillium expansum M-02, standardized at 10⁵ spores per plate. Inhibitory activity was assessed by measuring fungal growth inhibition zones around the isolates, compared to negative controls. The characterization of the isolates by Gram staining revealed differences in the bacterial profiles obtained using different culture media. On conventional TSA medium, 109 isolates were obtained, of which 63 were Gram-positive (57.8%) and 46 Gram-negative (42.2%). On the other hand, 85 isolates were recovered from pasteurized TSA, with 43 being Gram-positive (50.6%) and 42 Gram-negative (49.4%). Three isolates, one Gram-negative and two Gram-positive, exhibited antibacterial activity exclusively against P. aeruginosa. Regarding antifungal activity, only one bacteria inhibited the growth of the fungal pathogen, indicating its potential to produce biotechnologically relevant metabolites. The detection of antimicrobial activity against P. aeruginosa is

particularly relevant, as this genus is considered a therapeutic challenge due to its high intrinsic and adaptive resistance. Simultaneously, the control of phytopathogenic fungi such as P. expansum is also an increasing demand, since these pathogens cause significant agricultural losses and may produce mycotoxins harmful to health. Thus, the isolates obtained in this study represent promising candidates for the development of new antibiotics as well as agricultural biocontrol agents. These results also demonstrate the ecological role of the Amazonian soil microbiota in producing antimicrobial compounds and highlight the importance of its sustainable exploration. The next steps include testing other bacterial and fungal pathogens and taxonomic identification through 16S rDNA gene sequence, aiming to consolidate the biotechnological potential and biosafety of these isolates.

Keywords: Soil bacteria; Antimicrobials; Pseudomonas aeruginosa.; Penicillium expansum; Amazon

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