

Isolation and Characterization of Bacteria with Antimicrobial Activity from Malawian Soil Samples

AUTHORS

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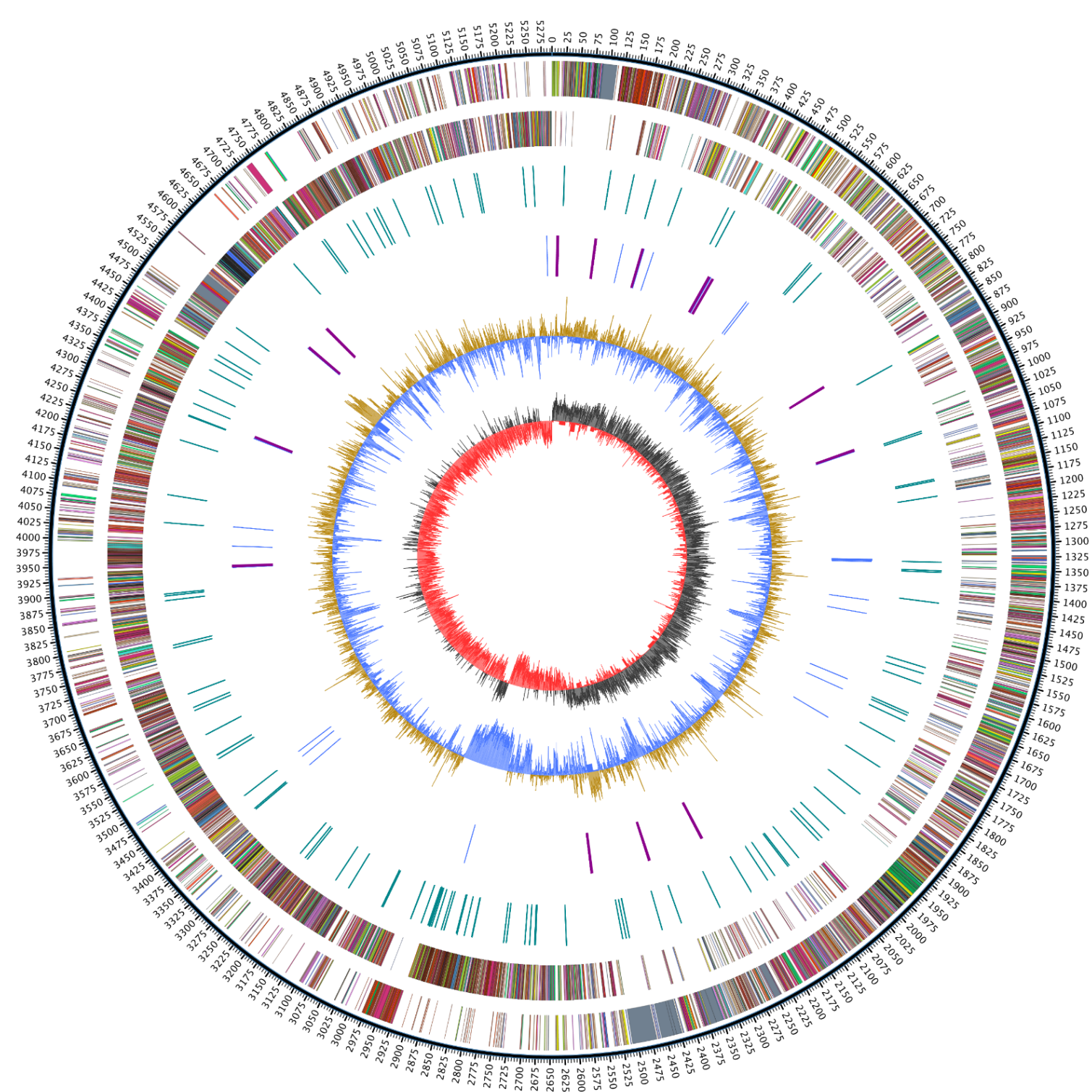
I. INTRODUCTION

Agricultural systems face a variety of challenges that threaten their sustainability and productivity. These challenges are closely linked to climate change, farming practices, soil nutrient levels, the soil microbiome, and infestations of phytopathogens on roots and plants. In this study, rhizospheric bacteria were isolated from Malawian agricultural soil samples. The antimicrobial activity of one bacterial isolate was evaluated against different disease associated and spoilage inducing pathogens. Moreover, the bacterial species and antimicrobial substances were determined through whole genome sequencing and mass spectrometry.

II. METHODS AND RESULTS

Malawian Soil → Isolation of *Bacillota*

Whole Genome Sequencing



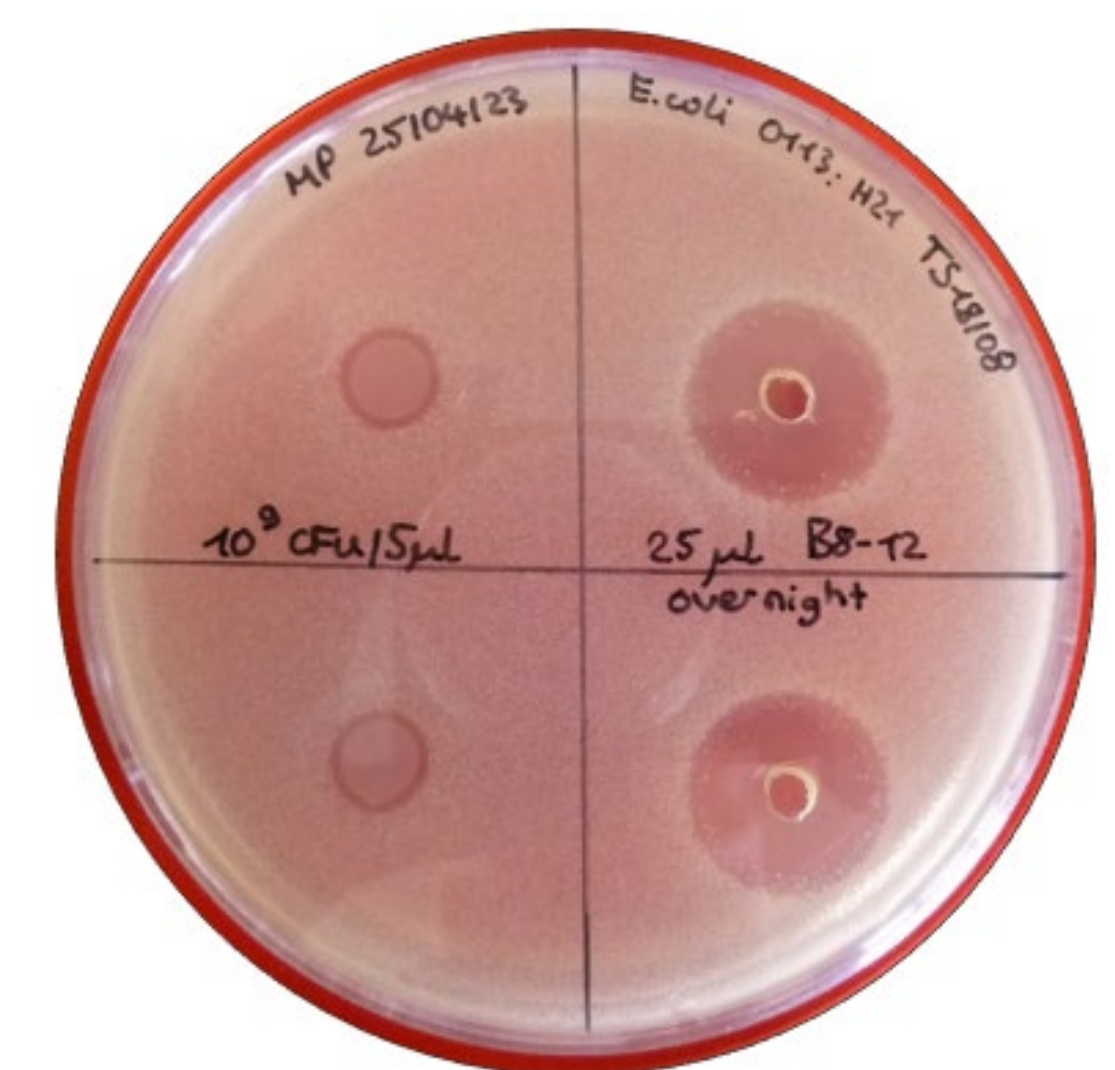
16S rRNA Gene Determination

Niallia nealsonii

Priestia sp.

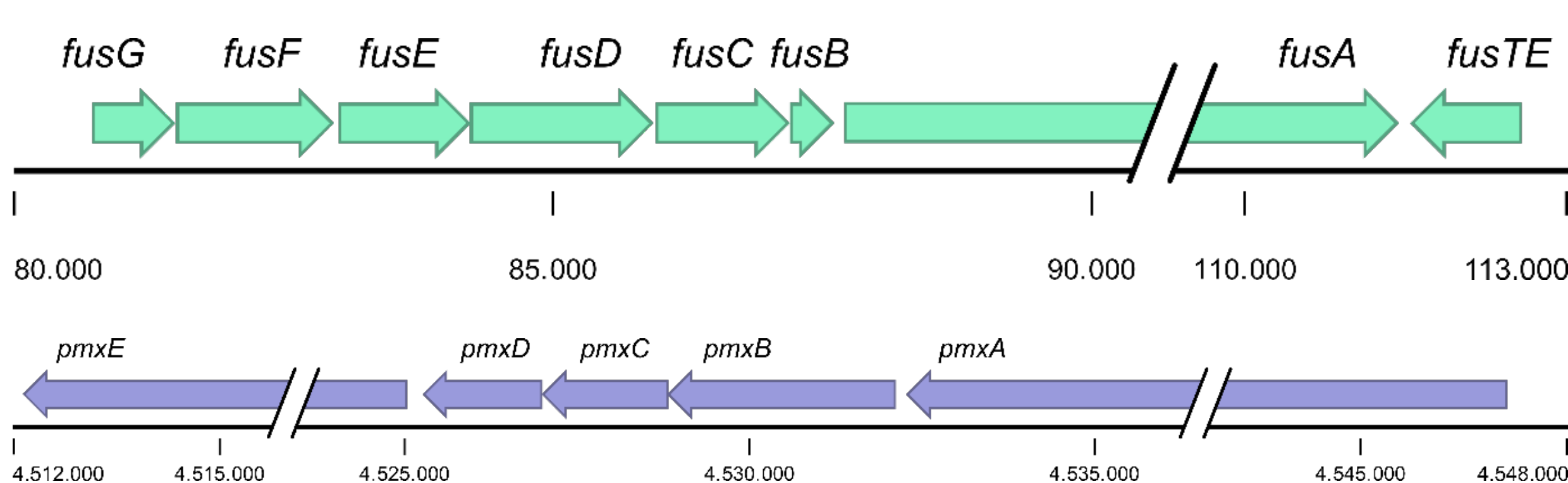
Paenibacillus sp.

Antimicrobial Testing



→ antimicrobial activity against *Listeria monocytogenes*, pathogenic / non-pathogenic *Escherichia coli* strains, *Staphylococcus aureus*, *Staphylococcus carnosus*, *Pseudomonas fluorescens*, *Salmonella* Senftenberg

Antimicrobial Substances



Gene cluster for the synthesis of:

Polymyxin

Fusaricidin

Paenilipoheptin

Bacitracin

Mycosubtilin

Tridecaptin

Agar Well Diffusion Assay

Treatment of the Inhibition Zone

LC – MS Analysis

Secondary Metabolite NRPS:

Polymyxin synthetases

Paenilipoheptin synthetases

Bacitracin synthetases

Fusaricidin synthetases

III. CONCLUSION

A Gram-positive bacterium of the *Paenibacillus polymyxa* complex was isolated from agricultural soil procured from Malawi. The rhizospheric bacterium was able to inhibit the growth of important food-borne pathogens. Whole genome sequencing revealed the presence of different non-ribosomal peptide synthetases for the synthesis of antimicrobial substances. The potential of found plant growth stimulating genes together with antimicrobial activities needs further evaluation for the possible application of *Paenibacillus* sp. as a biocontrol agent.

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