



Faculty of Geotechnical
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Management



Master's Thesis

Diversity of Bacteriophages in Cyprus Agricultural Soil

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Faculty of Geotechnical Sciences and Environmental Management

Department of Agricultural Sciences, Biotechnology and Food Science

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Approval Form

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ABSTRACT

Bacteriophages are prokaryotic viruses that infect bacteria and archaea. They exist in all ecosystems and are considered the most abundant biological entities on earth. Phages, with their ability to infect and lyse bacteria, are vital to their respective habitats as they regulate bacterial communities, mediate horizontal gene transfer, and cycle nutrients. Biodiversity, abundance, functions, and interactions with their host have been extensively studied in marine ecosystems, but their importance in terrestrial ecosystems has recently started to draw attention. Soil ecosystems are considered one of the most biologically complex environments on Earth, and the role of phages in it is vital both ecologically and agriculturally. Additionally, the improvement of high throughput sequencing and metagenomics has helped scientists and phage hunters worldwide to shed light on the subject. As no research has been conducted on soil phage diversity in Cyprus, we have selected multiple agricultural fields across the island. Soil geochemical properties were measured, and eDNA was extracted for high throughput sequencing (shotgun metagenomics). Bioinformatics analysis was then performed with various viral prediction tools to detect phages in soil metagenomes accurately. Furthermore, α -diversity and β -diversity were calculated and analysed to assess the possible effects of soil chemistry and spatial metrics on bacteriophage communities. In total, 2064 unique phage taxa were observed across all samples. Additionally, α -diversity indices were significantly correlated with Nitrogen, and β -diversity along with variance partitioning revealed nitrogen and elevation as significant factors explaining between sample variance. Furthermore, indicator species analysis revealed 35 phage taxa as significant indicators across the 3 nitrogen groups.

Keywords: Soil, Bacteriophages, Metagenome, Contigs, Diversity