POSTER COMMUNICATIONS

Session 1 - Methods and Applications

Metagenomic approach to identify genes encoding forglycosidehydrolases in composting samples

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Metagenomics involves the study of the genomic DNA from a set of microorganisms present in a particular environmental sample. This approach has emerged as a promising culture-independent technique to explore the diversity and function of microbiomes, allowing the discovery of novel biochemical compounds, namely enzymes with high potential for industrial applications. Composting habitats are characterized by a high microbial diversity, and represent a suitable source of robust enzymes able to convert the recalcitrant structure of lignocellulose, such as cellulases, endo-hemicellulases, oligosaccharide-degrading enzymes, and debranching enzymes. In fact, several lignocellulose-degrading enzymes have been successfully identified in composting samples following metagenomic approaches. The efficient handling, processing, and analysis of the large metagenomic datasets generated by next-generation sequencing platforms can be achieved using advanced bioinformatics pipelines.

In this work, composting samples were collected from three Portuguese composting units, which handle different types of wastes. The metagenomic DNA was extracted from the composting samples, the three composting metagenomes were analyzed by shotgun sequencing and a comparative analysis was performed between our samples and composting samples selected from the literature to evaluate the potential of these environments for lignocellulosic biomass conversion. The metagenomic sequencing data from all samples were processed using appropriate bioinformatics tools and the functional annotation of genes encoding glycoside hydrolases was carried out using the CAZy database. Our bioinformatics pipeline revealed that all samples were enriched in cellulases, endoglucanases, and β-glucosidases, which confirms the richness of composting habitats, regardless of waste compositions, in lignocellulose-degrading enzymes. As these compost samples were collected in the thermophilic phase, the identified enzymes may harbor interesting features for industrial purposes, including catalytic activity under high temperatures.