Research of phosphate accumulating microorganisms from WWTPs for the recovery of phosphorus from organic wastes (3BV.3.47)

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Introduction

Many wastes containing reusable components, such as nitrogen, phosphorus and potassium, are not exploited through ideal processes. As an example, in Wallonia (Belgium), the main treatment applied to sewage sludge consists in incinerating the material. Such a process is chosen when the heavy metals are too concentrated in the sludge, preventing an agricultural use. However, sewage sludge, as well as manure, slurry and digestate, contain notable amounts of nutrients (nitrogen, phosphorus and potassium). Some Waste Water Treatment Plants (WWTPs) are actually designed in order to promote Phosphate Accumulating Organisms (PAOs), able to store or release phosphorus in accordance with the environmental conditions. The aim of this work is to isolate PAOs from WWTPs and evaluate their applicability to phosphorus recovery from organic wastes. Metagenomics and metabolic properties are also considered. This work is supported by the BioRefine Project, a European project in which various member states focus on recovery of inorganics from organic wastestreams.

The biological phosphate removal from wastewater is achieved by a specific microflora in WWTPs

**Anaerobic conditions**

\[ \text{Glycogen} \rightarrow \text{Polyhydroxybutirate} \rightarrow \text{ATP} \rightarrow \text{PO}_4^{3-} \]

**Aerobic-anoxic conditions**

\[ \text{Glycogen} \rightarrow \text{Polyhydroxybutirate} \rightarrow \text{ATP} \rightarrow \text{PO}_4^{3-} \]

**CH\textsubscript{3}COOH**

**PO\textsubscript{4}^{3-}\textsuperscript{1}**

Sampling of activated sludge in 3 WWTPs achieving a 100% biological phosphate removal

**WWTP\textsubscript{1}**

**WWTP\textsubscript{2}**

**WWTP\textsubscript{3}**

**WWTP\textsubscript{2}, Negative control**

Analyses

Fingerprints of consortia (flow cytometry)

Enrichment of consortia (SBR)

Analysis of the consortia through metagenomics

Analysis of the consortia through BIOLOG Eco Microplates

What are the purposes of the analyses?

**Metagenomics**

Metagenomic analyses will provide data about the composition of the microflora

**BIOLOG Eco Microplates**

BIOLOG Eco Microplates will provide data about the metabolic properties

Flow cytometry

Flow cytometry can establish the profiles of consortia on the basis of fingerprints

Consortia can be enriched in PAOs through the use of the SBR system

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