MICROBIAL COMMUNITY IN A BIOFILTER TREATING ODOURS FROM AN ORGANIC RECOVERY PLANT FOR MUNICIPAL SOLID WASTE TREATMENT

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ABSTRACT

Municipal solid waste treatment (MSW) stations with energetic valorization make use of the biogas produced by the digestion of organic matter to generate energy. However, complex odours components associated with the MSW activities, like hydrogen sulfide (H_2S), organic reduced sulfur compounds (e.g.,CH_3SH), and volatile organic compounds (VOCs) have to be controlled. The current work aims to manage these compounds using biological air treatment systems, such as biofilters. A biofilter filled with a mixture of wood-chips and compost was implemented at a MSW. Inocula from lab scale reactors treating organic compounds was used during the start up. The microbial communities present in this matrix, in the inoculum and in matrix after an acclimatization period was investigated. Microbial communities differed at each stage. After 16S rRNA analysis, 27 different isolates were identified from the initial matrix, 11 from the inoculum and 29 from the matrix after the acclimatization period. Twenty seven of the recovered isolates were able to oxidize sulphur compounds in solid medium (Sulphur Oxidizing Medium). Of those, 37% belong to the *γ-Proteobacteria* phylum. Their capacity to grow in liquid medium is under evaluation.

MATERIAL AND METHODS

- **Sampling** A sample of the biofilter matrix (mixture of wood-chips and compost), inocula (from the lab) and matrix, after an aclimatization period (72h), was collected to pre-weight sterile bags.
- **Microbial counts** Colony forming units (CFUs) were determined based on the surface-plate counting procedure (in Nutrient Agar (NA)). The original samples were then prepared to be stored at -80ºC with 30% glycerol.
- **Bacterial isolation** Different bacterial colonies were isolated based on size, morphology and pigmentation, from NA plates using a streak-plate procedure. Pure bacterial isolates were stored at -80ºC with 30% glycerol.
- **DNA Sequencing Analysis** After 16S rRNA extraction, a Random Amplified Polymorphic DNA (RAPD) using OPA3 primer was performed. The isolates amplification was carried out with the universal primers f27 and r1492 (Lane, 1991) under standard polimerase chain reaction (PCR) conditions (Rainey et al., 1996).
- **Growing in Sulphur Oxidizing Medium** Each different isolate was plated in Sulphur Oxidizing Medium (SOM). With those that grew, batch liquid cultures were set up. Cultures were incubated on an orbital shaker (150 rpm) at 25ºC. Optical density (λ600nm) was monitored for 20days.

REFERENCES

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- Rainey, F. A., Ward-Rainey, N., Kroppenstedt, R. M. and Stackebrandt, E. (1996) The genus Nocardiopsis represents a phylogenetically coherent taxon and a distinct actinomycete lineage: proposal of Nocardiopsaceae fam. nov.. International Journal of Systematic Bacteriology 46:1088-1092.

ACKNOWLEDGEMENTS

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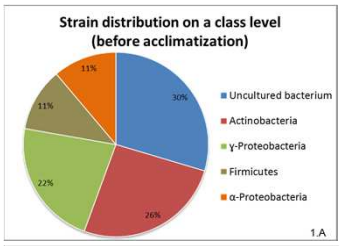
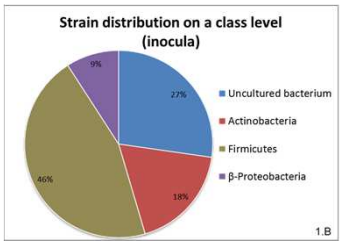
RESULTS AND DISCUSSION

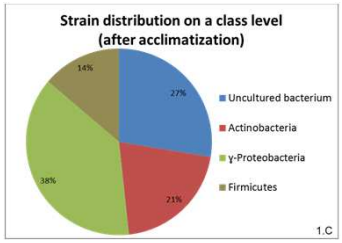
- CFU/g ranged from 10^8 (matrix), 10^6 (inoculum) to 10^8 (after acclimatization);
- A total of 67 different isolates were analysed and sequenced;
- Microbial communities differed at each stage.



- In the initial matrix, 27 different isolates were identified.
- *Actinobacteria* > *γ-Proteobacteria* > *Firmicutes* = *α-Proteobacteria*



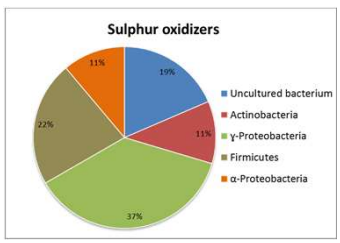
- The inoculum was composed of 11 different isolates.
- *Firmicutes* > *Actinobacteria* > *β- Proteobacteria*



- After acclimatization period, 29 different isolates were identified
  - 9 ≈ initial matrix;
  - 2 ≈ inocula.
- *γ-Proteobacteria* > *Actinobacteria* > *Firmicutes*

Figure 1: Proportions of taxonomic groups represented by the isolates (1.A: before aclclimatization; 1.B: inocula; 1.C: after acclimatization).

- Of the 67 isolates, 27 were able to oxidize sulphur compounds in SOM.



- 15 ≈ initial matrix;
- 4 ≈ inocula;
- 8 ≈ after acclimatization
- *γ-Proteobacteria* > *Firmicutes* > *Actinobacteria* = *α-Proteobacteria*

Figure 2: Proportions of taxonomic groups represented by the isolates able to oxidize sulphur compounds.

The identified γ-Proteobacteria isolates are commun in contaminated sources.

FURTHER WORK

- Assess the ability of the 27 isolates that grew on solid medium to grow in liquid medium supplied with a H2S gas source.