

Deciphering the Genome to Phenome relationship in *Pseudomonas citronellolis* at varying methane concentrations

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The environment and conditions present around an organism govern how the organism responds to adapt and survive in its environment. These responses are predetermined based on the expression of specific genes under various conditions, and hence, such genes determine the phenotypic response of the bacteria. Methane, a naturally and anthropogenically produced simple and abundant C1 gas is capable of being utilised by methanotrophic and heterotrophic organisms as a cheap and effective carbon source, instead of being released into the environment where it accelerates greenhouse effect. Utilisation of an effective mediator of this concept – *Pseudomonas citronellolis*, known for its ability to accumulate PHA under stress (Polyhydroxyalkanoate – poly-(R)-3-hydroxybutyrate), a natural biodegradable biopolymer with the capability to replace petro-plastics, would result, not only in methane bio-remediated, but accumulation of a value-added product of paramount industrial importance, allowing us to harness its true potential. A precise Genome-to-Phenome correlation allows us to modulate the response of *Pseudomonas citronellolis* to various concentrations of methane, in order to enhance the accumulation of PHA. Additionally, methane uptake and assimilation rate enhancement by optimising methane monooxygenase (MMO) activity as well as optimised stress induction can facilitate increased biomass and PHA accumulation respectively. Advanced imaging techniques, namely – Scanning Electron Microscopy, Atomic Force Microscopy and Brunauer-Emmett-Teller – Surface area analysis would be used for the determination of phenotypic characters respective to efficient methane assimilation which would be correlated with the transcriptome analysis for the determination of genome-phenome responses of the bacteria to the varying methane environment. Similarly, response to other similar carbon sources as electron donors could be extrapolated, thereby allowing use of other cheap and abundant carbon sources to facilitate PHA accumulation.

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