



ANALYSIS OF RESPONSIBLE GENES IN THE BIOSYNTHESIS OF GEOSMIN AND 2-MIB IN LABORATORY CULTURED CYANOBACTERIA

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Abstract

Geosmin and 2-MIB are common, earthy and musty-smelling sesquiterpenes, produced by *Actinomycetes* and cyanobacteria. These compounds result in objectionable and unpleasant tastes and odours (T & O) in drinking water. This is a common and recurrent problem in global municipal water supply. Hence, the current study was focused on the determination of genes responsible for biosynthesis of Geosmin and 2-MIB in cyanobacteria. Cyanobacteria were isolated from drinking water reservoirs and were cultured in the laboratory. Exponentially growing cultures were subjected to extraction of Geosmin and 2-MIB following Solid Phase Micro Extraction (SPME) and quantification was done using the Gas Chromatography Mass Spectrometry (GC/MS). Polymerase chain reaction (PCR) screening was carried out to confirm the presence of Geosmin and 2-MIB producing three major gene clusters; Geosmin synthase gene (*geo A*), SAM dependent methyl transferase gene (*mtf*) and monoterpene cyclase gene (*mic*). Out of four cyanobacteria species, *Pseudanabaena* sp., *Nostoc* sp., *Lyngbya* sp. and *Oscillatoria* sp., the highest concentrations of 2-MIB (532.5 ± 2.1 ng/L) was recorded by *Pseudanabaena* sp. after four weeks of cultivation whereas *Nostoc* sp. (162.6 ± 1.8 ng/L) recorded the highest concentration of Geosmin. Both *Pseudanabaena* sp. and *Nostoc* sp. cultured showed significantly high Geosmin and 2-MIB production compared to all other cyanobacteria species tested and the lowest Geosmin (10.8 ± 2.8 ng/L) and 2-MIB (50.8 ± 2.2 ng/L) production was recorded in *Lyngbya* sp. culture. All four species harbored 'geo A' gene at 905 bp reconfirming Geosmin synthesizing ability. However, only *Pseudanabaena* sp. and *Nostoc* sp. showed presence of 'mtf' gene at 870 bp confirming 2-MIB synthesizing capability. None of four species showed the presence of 'mic' gene at 726 bp. This may open path to understand a new synthesizing pathway to 2-MIB and further research are on progress.

Keywords: Biosynthesis, Geosmin, 2-MIB, *Pseudanabaena* sp., *Nostoc* sp., PCR analysis