TITLE: POTENTIAL METHANE PRODUCTION IN AMAZONIAN FLOODPLAIN SOILS FOR PROJECTED CLIMATE CHANGE SCENARIO

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ABSTRACT

Amazonian floodplain soils store large amounts of organic carbon, which can be released to the atmosphere as methane (CH_4) gas. In this study was explored the importance of acetoclastic, hydrogenotrophic, and methylotrophic methanogenesis in floodplains of the Negro (black water), Tocantins (clear water), and Solimões (white water) rivers in the Brazilian Amazon. For this purpose, was considered an increase in 2°C predicted by experts for this region as a consequence of climate change in order to evaluate the potential for CH_4 production by soil microbiota using anaerobic batch reactors. Soil samples were enriched with culture medium containing sodium acetate, sodium formate, and methanol, separately, to stimulate acetoclastic, hydrogenotrophic, and methylotrophic metabolisms, respectively. Additionally, glucose was used as an inducer of anaerobic fermentation. CH_4 production was monitored by gas chromatography in a total of 144 bioreactors. Total DNA from the enriched and incubated soils was hybridized on microarray named GeoChip v.5.0S. The CH_4 production potential of bioreactors with sodium acetate (0.19 ± 0.04 to 595.38 ± 149.69 $\mu mol.g^{-1}$ soil) and methanol (0.08 ± 0.02 to 1474.72 ± 391.86 $\mu mol.g^{-1}$ soil) was higher when compared to enrichments with sodium formate (0.11 ± 0.00 to 41.96 ± 1.22 $\mu mol.g^{-1}$ soil). The highest CH_4 production for the enrichments with sodium acetate, glucose and methanol were observed in agricultural soil from white water floodplain during the non-flooded period (595.38 ± 149.69, 2043.86 ± 198.51, 1474.72 ± 391.86 $\mu mol.g^{-1}$ soil, respectively). This high CH_4 production was observed for the highest incubation temperature (33.60°C). The higher percentage of hybridizations by Geochip (v.5.0S) for carbon degradation, fixation and methanogenesis were not associated with higher CH_4 production. Together, our results revealed that in the projected future climate change scenario there is a potential contribution to CH_4 fluxes by methylotrophic methanogens.

Keywords: Anaerobic Degradation; DNA microarray; Sodium Scetate; Sodium Formate; Methanol.

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