

Oral presentation: 66

Isolation and identification of thermophilic bacteria and cyanobacteria from Maha Oya hot springs in Sri Lanka

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Hot springs are a rich source of thermophilic microorganisms such as bacteria, cyanobacteria and archaea. Though, there are several hot springs recorded in Sri Lanka, a comprehensive community analysis of thermophilic microorganisms in these springs is inadequate. Therefore, the present study was conducted to isolate and identify the thermophilic bacterial and cyanobacterial diversity in Maha Oya hot springs. Water samples were collected from the surface and the bottom of the seven wells of Maha Oya hot water springs, which showed temperatures ranging from 42 to 59.8^oC and pH ranging from 6.89-7.63. Water samples treated with Lugol's iodine as well as microbial mats growing on water surface and attached to the surface of wells, were observed under a light microscope to determine the presence of cyanobacteria. Thermophilic bacteria were isolated by inoculating a dilution series (10⁰, 10⁻² and 10⁻⁴) of water samples separately into nutrient agar medium and incubating at 55^oC for 48 hours. Water and microbial mat samples were inoculated into cyano-specific BG11 and BG11₀ media and incubated at 55^oC and 12:12 hours dark:light cycle to isolate culturable thermophilic cyanobacteria. Based on morphological (colony morphology, Gram staining, endospore staining and motility test) and biochemical (oxidase activity, catalase activity, H₂S production, citrate utilization, glucose fermentation) characteristics, the isolated bacteria were identified as *Bacillus thermoamylovorans*, *Meiothermus* sp. and *Bacillus schlegelii* which have been previously reported as thermophiles. Morphological identification of both uncultured and cultured cyanobacteria revealed the presence of eight different cyanobacterial genera. The most abundant genus was *Oscillatoria*. Additionally, *Calothrix*, *Synechococcus*, *Gloeocapsa*, *Gloeotheca*, *Cylindrospermopsis*, *Lyngbya* and *Pseudanabaena* were observed. The isolation and identification of these thermophiles could be useful in mass scale production of thermostable enzymes and other bioactive compounds with biotechnological and industrial applications.

Keywords: Bacteria, cyanobacteria, hot springs, Maha oya, thermophilic