Isolation, Characterization and Screening of Bacterial Isolates from Lake Magadi for Exoenzyme
and Antimicrobial activity

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# ABSTRACT

Microorganisms from soda lakes have attracted attention as a possible source of novel enzymes and metabolites for use in biotechnology and developing new applications such as medicine, food, and research reagents. Many studies on alkaliphilic bacteria; isolation, characterization and identification, have been done on Kenyan soda lakes. However, very little has been documented on Lake Magadi, a hyper saline lake with up to 30% salinity levels. This study sought to bioprospect for alkaliphilic bacteria from Lake Magadi that could produce novel bioactive compounds and document for further exploitation. 55 isolates were isolated using different media prepared with filter-sterilized water from the lake. These were characterized using cultural, biochemical and molecular approaches, and screened for production of extracellular enzymes as well as potential for production of antimicrobial compounds. The bacteria were Gram positive and Gram negative, and they grew well at pH ranging from 5 – 10, temperature range of 25 – 50 $^{o}$C and sodium chloride range of 0- 30 %. The isolates produced various extracellular enzymes such as amylases, lipases, proteases, cellulases and esterases. Antimicrobial assays done to determine the isolates range of *in vitro* activity against test organisms exhibited a range of inhibitory effects. 17 isolates produced coloured pigments into the media indicating that they could produce diverse bioactive metabolites.Analysis of partial sequences using Blast showed that 80 % of the isolates were affiliated to the genus *Bacillus* while 20 % were affiliated to members of *Gammaproteobacteria.* Isolates A5, A14 and A30 clustered with *Bacillus* at 96-97 % similarity. A11 scored 96 %, and had several neighbors with similar percentage similarity such as *Alcaligenes faecalis* strain CL-10.3a, *Streptomyces sp*. VITSVK5, *Achromobacter sp*. DBTN3, *Bordetella* sp. VVAR and uncultured *beta proteobacterium* clone L21. A19 clustered with members of the genus *Stenotrophomonas* with a score of 95 % similarity. These could

represent novel species within the Lake ecosystem. A22 had *Anoxybacillus sp*. C163a and *Kocuria sp.* M14 as the nearest neighbors in BLAST with 80 % and 81 % similarity respectively. A32 and A47 clustered with *Bacillus* at 80 % and 81 % similarity respectively while A31 clustered with *Klebsiella pneumoniae* at 87% similarity. These could represent novel genera of organisms. This study demonstrated that the extreme environment of Lake Magadi harbors novel Alkaliphilic bacteria that can produce enzymes and antimicrobial compounds.