ABSTRACT

Cellulolytic microorganisms such as fungi and bacteria are responsible for much of the cellulose degradation in soils. Despite this vast number of cellulase producers, there is a deficiency of microorganisms that can produce significant amount of the three cellulase enzyme specifities i.e. endoglucanases, exoglucanases and cellobiases to efficiently degrade cellulose to fermentable products. Little emphasis has been given to cellulase production from bacteria despite their extremely high natural diversity, which endows them with the capability to produce stable enzymes.

Soil samples were collected from Hell's gate and from a geothermal well in Eburru hill at depths of 155 Metres, 156 Metres and 157 Metres in the Kenyan Rift valley. The soil samples were inoculated separately and from each, only a single bacterial isolate was obtained. The four isolates were screened for cellulolytic activity using Congo red stain on Carboxymethylcellulose (CMC) agar plates inoculated with the isolates. All the isolates were found to hydrolyze Carboxymethylcellulose.

A Gram stain test carried out identified the four isolates as Gram-positive rods. Phylogenetic analysis indicated that they all associated mainly with members of the *Bacillus licheniformis*.

Eburru 156 isolate (Isolate 3) selected for further functional studies bore the three enzyme specificities of a cellulase enzyme system. A crude enzyme extract was found to hydrolyse Cellobiose, Avicel and CMC with enzyme activities of 0.46878U/mg, 0.18784U/mg and 0.13571U/mg respectively. Optimum temperature for activity measured over 60 minutes was found to be 60°C with relatively high activity at both 70°C and 80°C. The optimum pH at the predetermined optimum temperature was found to be pH 5. This thermotolerance in addition to

production of the three cellulase enzyme activities makes the isolate attractive for potential application in the biorefinery industry.