

Optimization of removal thermotolerant coliform (TTC) from drinking water using bio-sand filter (BSF) Masafer Yatta/Hebron West Bank – occupied Palestinian territories

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ABSTRACT

In Massafer Yatta–Hebron Governorate, around 1,400 Palestinian people are herding sheep and goats and live in caves and movable tents without a water network or sewer system. In the winter season rainwater is harvested for drinking purposes and stored in underground cisterns. Yet, sporadic water quality tests indicated a contamination level of micro-organisms ranging from 20 to 100 Colony Forming Unit (CFU/100 mL). In this area, rife with political conflicts, connection to a piped network seems unsure, at best, and calls for using natural and available resources to filter clean and potable water are justified. This study addresses these social requests by testing the efficiency of Thermo Tolerant Coliform removal (TTC) using bio-sand filters (BSFs) under real conditions in a full factorial design of experiment. The dependent variables are charge volume, age of BSF, the outside temperature, residential time, turbidity, water sources, and free chlorine contents. The independent variables are volume of BSF and sand grain size. The result shows that the 5 h residence time of water and the media age of more than one month is significant to remove the TTC from drinking water with *P*-values of 0.0439 and 0.0089, respectively. Water with 500 CFU/100 mL, TTC needs more than 5 h residence time to reduce the TTC below the 10 CFU/100 mL. Turbidity and sources of drinking water did not affect the removal of TCC, yet, using 0.18 mm effective sand grain size was significant in removing TTC. The adoption of a 23 h water residency period was the most important of all operating parameters including the 0.18 mm effective sand size to remove about 99.8% of TTC. This study recommends a BSF that generates more than 20 L in 23 h, and the BSF Schmutzdeke should be replaced every 4 y.

Keywords: Bio-sand filter; Drinking water; Factorial design; Thermotolerant coliform

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