

Point-of-use water purification using clay pot water filters and copper mesh

AJ Varkey* and MD Dlamini

Department of Physics, University of Swaziland, Private Bag 4, Kwaluseni M201, Swaziland

Abstract

Lack of clean water for use by rural communities in developing countries is of great concern globally. Contaminated water causes water-borne diseases such as diarrhoea, which often lead to deaths, children being the most vulnerable. Therefore, the need to intensify research on point-of-use (POU) water purification techniques cannot be overemphasized. In this work, clay pot water filters (CPWFs) were fabricated using terracotta clay and sawdust. The sawdust was ground and sieved using 300, 600 and 900 μm sieves. The clay and sawdust were mixed in the ratios 1:1 and 1:2, by volume. Pots were then made, dried and fired in a furnace at 850°C. Raw water collected from nearby rivers was filtered using the pots. The raw and filtered water samples were then tested for *E. coli*, total coliforms, total hardness, turbidity, electrical conductivity, cations and anions. The 600 μm pot had the capacity to destroy *E. coli* completely from the raw water, whereas the 900 μm pot reduced it by 99.4%. The 600 μm and 900 μm pots could reduce the total coliform concentration by 99.3% and 98.3%, respectively. An attempt was also made to investigate the germicidal action of copper on the coliforms in raw water, with a view to utilizing it in the CPWFs. Results showed that 10 g of copper, in the form of mesh made of thin wire of diameter 0.65 mm, had the capacity to completely eliminate *E. coli*, by immersing it in 300 ml of raw water for 5 h, and total coliforms, by immersing it for 10 h. Subsequently, copper was added to the CPWF by placing the mesh in the receptacle of the CPWF. Tests showed that copper could destroy any remaining *E. coli* in the filtered water, rendering the CPWF a completely viable POU technique for producing clean water. All other critical parameters such as total hardness, turbidity, electrical conductivity and ions in the filtered water were also within acceptable levels for drinking water quality. The filtration rate of the pot was also measured as a function of grain size of the sawdust and height of the water column in it. The filtration rate was found to increase with grain size and height in all of the pots.

Keywords: clay, sawdust, porous pot, POU water filter, *E. coli*, total coliform, copper