DEVELOPMENT OF A PORTABLE, COST EFFECTIVE AND USER-FRIENDLY COLORIMETER FOR RAPID, *IN SITU* DETECTION OF BACTERIAL COUNT IN DRINKING WATER

A dissertation submitted to the

Faculty of Animal Science and Export Agriculture

Uva Wellassa University

in partial fulfillment of the requirement of

the degree of

Bachelor of Science in Aquatic Resources Technology

by

HERATH MUDIYANSELAGE MALSHA MADUSHANI

Department of Animal Science

Faculty of Animal Science and Export Agriculture

Uva Wellassa University

2020

Abstract

Having safe drinking and processing water can avoid people from countless diseases. Microbial contamination of water is the major source for water borne diseases. It requires at least 24 hours to obtain results with traditional culture methods and biotechnological bacteria detection methods such as polymerase chain reaction (PCR), Fluorescence analysis, enzyme-linked immunoassay (ELISA). They also required special controlled conditions, trained personnel and expensive reagents. Therefore, application of a bacteria detection method for *in situ*, rapid detection of bacteria count in drinking water with convenience is a timely necessity. Also, it should reduce the cost and time compared to the traditional and biotechnological methods. This study focused on identifying the most suitable staining dye and determining its efficacy on a portable device which was designed for rapid detection of bacterial count in drinking water. This portable device was designed according to the working principle of colorimeter, which explain with Beer – Lambert's law. Concentration of a color solution is directly proportional to the amount of light absorbed by a solution and the length of a light path through the solution. In order to select the most suitable stain for the device, different stains were used to stain bacteria samples. Then they were tested under different parameters to take absorbance values with "Bench Top Spectrophotometer". Bacterial solution of $1x10^8$ (according to MacFarland's' standard) was stained with 11 individual dyes and compared the absorbance values for accuracy with the unstained bacterial sample. Methyl Red (MR) showed higher accuracy and optimization of MR staining was performed with variable time period and stain concentration. The results indicated the best concentration of MR stain as 12.5 µL/mL and the optimum time of staining as 30 seconds. Based on the results MR was the most suitable stain to observe bacteria concentration in drinking water using absorbance method.

Keywords: Drinking water; Bacteria count; Staining; Portable device