

## Assessment of *Pseudomonas aeruginosa* biofilm-forming capacities from drinking water in water vending machine

<sup>1</sup>Elexson, N., <sup>1</sup>Sabrina, H., <sup>1</sup>Dalene, L., <sup>1</sup>Eddy, B., <sup>1</sup>Nurul, F.R., <sup>1</sup>Nasra, P., <sup>1</sup>Grace, B.,  
<sup>1</sup>Nick, L., <sup>1</sup>Amirah, Z.J., <sup>1</sup>Nur, D.Z., <sup>1</sup>Dayang, N.A.B., <sup>1</sup>Manju, S. and <sup>2,3,\*</sup>Tunung, R.

<sup>1</sup>Faculty of Resource Science and Technology, University Malaysia Sarawak, 94300, Kota Samarahan, Sarawak, Malaysia

<sup>2</sup>Institut EkoSains Borneo, Universiti Putra Malaysia Bintulu Sarawak Campus, 97008 Bintulu, Sarawak, Malaysia

<sup>3</sup>Faculty of Humanities, Management and Science, Universiti Putra Malaysia Bintulu Sarawak Campus, 97008 Bintulu, Sarawak, Malaysia

### Article history:

Received: 12 May 2021

Received in revised form: 24 June 2021

Accepted: 23 August 2021

Available Online: 11 May 2022

### Keywords:

Biofilm,  
*Pseudomonas aeruginosa*,  
Water Vending

### DOI:

[https://doi.org/10.26656/fr.2017.6\(3\).324](https://doi.org/10.26656/fr.2017.6(3).324)

### Abstract

The establishment of *P. aeruginosa* with biofilm formation in water vending machines may cause serious health issues to the consumers and its emergence has led to the public's concern. This study aimed to assess the quality of water vending machines and to evaluate the biological contaminant *P. aeruginosa* in biofilm capacities. The qualities of the drinking water from a total of fifteen (n = 15) water vending machines at Kota Samarahan were evaluated based on physical and chemical parameters including pH value, turbidity, total of carbon (TOC), total dissolved solid (TDS) and total suspended solid (TSS). The colonies *Enterobacteriaceae* has been morphology characterized through biochemical tests and *P. aeruginosa* bacteria was identify through the PCR method. The results of the physical and chemical parameters complies with the authority standard including turbidity values found in conformance with values were lower than 0.1 NTU. Morphological analysis with a total of 66.7% (n = 10) was detected with the presence of *Enterobacteriaceae*, and a total of 40% (n = 6) of the isolates were found to be *P. aeruginosa*. This study extended by assessing the potential strength of biofilm formation. The microtiter assay performed in a 96-well polystyrene microtiter plate showed that 83.33% (n = 5) of the bacterial isolates have moderate potential as biofilm producers, while only 16.67% (n = 1) isolates were non-adherent and showed no potential in producing biofilm. The highest OD isolates found occupying moderate biofilm strength was (mean = 0.217) and the lowest moderate biofilm strength was (mean = 0.136). In conclusion, the significance and impact of the study displayed the qualities of water vending machines complies with Food Act 1983, Regulation 360C and Malaysian Drinking Water Quality, Ministry of Health 1983. However, the presence of biological contaminants may raise consumer concerns. This study had successfully assessed the potential strength of *P. aeruginosa* biofilm collected from water vending machines. Further microbiological assessments should be perform continuously to predict and eliminate any future risks related to water vending machines.

## 1. Introduction

In this modern era, there has been an increase in the availability of water vending machines in populated urban areas. This trending demand is due to several reasons such as public infrastructure, modern working and lifestyle changes (Schillinger and Du-Vall Knorr, 2015). A water vending machine is an electronic machine that consists of a filtration system that dispenses filtered drinking water when inserted with the appropriate amount of money. Due to its convenience and affordable price, consumers gradually gravitate

towards using this machine as a source of clean drinking water for household use as opposed to boiling tap water which has an undesirable nickel-like taste to it and the belief that drinking tap water possesses a health risk because of its uncleanliness.

*Pseudomonas aeruginosa* is an aerobic Gram-negative bacterium and motile, non-spore-forming rods that are oxidase-positive and lactose non-fermenters. They cause urinary tract infections, respiratory system infections, dermatitis, soft tissue infections, bacteremia, bone and joint infections, gastrointestinal infections and

\*Corresponding author.

Email: [tunungrobin@gmail.com](mailto:tunungrobin@gmail.com)