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after 3.9 days (about 93.6 hrs). *Pseudomonas aeruginosa* signifcantly (p=0.03) (p<0.05) remediates PHs from Lake Albert water with maximum removal rate between day 1 and day 3. However, physico-chemical factors for example temperature, pH were not investigated in this current study.

Keywords: Bioremediation rate; Lake Albert; Petroleum hydrocarbons; *Pseudomonas aeruginosa*

Introduction

Uganda is presently trying to explore and engage in the exploitation of petroleum products. is is largely around the fresh water bodies in the Albertine Graben. On the other hand, the water bodies in Albertine graben are habitants for numerous water organisms and also the focal drinking water point sources. In spite of the fact that Lake Albert waters are known for quite a lot of uses both ecological and economical, they are expected to be extremely polluted by crude oil petroleum hydrocarbons (PHs). Consequently they will need to be dealt with by ecologically friendly methods. Bioremediation is one of such ways of which microorganisms of the species *pseudomonas aeruginosa* were used to biodegrade unsafe organic pollutants to ecologically safer toxic doses [1]. ese microorganisms embrace other bacteria and fungi like yeast and moulds [2]. ese microorganisms predominantly have been considered petroleum hydrocarbon biodegrading mediators living in the environment freely.

e PHs is progressively becoming water contaminants of great worry within the environment [3]. ey have the potential to dissolve in lipids within vulnerable water organisms meaning they can bio accumulate in the food chain and can be delivered to other trophic levels of the food chain [4].

Furthermore, Spills of petroleum Hydrocarbons occurring on water usually are far more harmful than the spill on land [5]. e oil exploration industry in Uganda creates susceptibility of the country to petroleum related ecological encounters as well as spillage. Regrettably, there are no well-studied ecologically friendly means for bioremediation of petroleum hydrocarbons spillage in aquatic environment within the country. Oil exploration industry currently is in Buliisa District whose general populati on obtains water from point water sources that can be vulnerable to PHs contamination in case of crude oil spills [6].

e study aimed at exploring the rate at which *Pseudomonas aeruginosa* can reduce petroleum hydrocarbons spillage that may occur on Lake Albert water in future.

Materials and Methods

Study area and sample collection

Samples of water for this work were collected from Lake Albert at a point (01°32.032N, 03°57.958E) called Kaiso, selected because the oil

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Contaminated sample preparation

e PHs was purchased from oil and gas market in Kampala (Uganda). e experimental bottles along with the control were contaminated with the PHs up to 10%m/v (100 g/L). e control sample of Lake Albert water was autoclaved before being contaminated with PHs. [Both the control and the natural (experimental) water were contaminated with 10% m/v PHs (100g/L)]. e experimental bottle was then inoculated with *Pseudomonas aeruginosa* (turbidity of 0.04 absorbance at 600 nm) (3.0×10^7colony-forming units (CFU)/mL) [7]. Both control and the experimental bottles were le at room temperatures to replicate the temperature of the natural water body in Uganda.

Culturing

Growth of *Pseudomonas aeruginosa* was done in a sterile nutrient broth (100 ml) incubated at 37°C for a period of 1.5 hours that was expected for the log phase of these species of bacteria [7].

Bioremediation procedure

Aliquot volume of water contaminated with petroleum hydrocarbon (10 mL), was introduced in a 250 ml ask in which there was nutrient broth (100 mL). And aliquot of a starter culture (100 μl) containing *Pseudomonas aeruginosa* of turbidity absorbance of 0.04 at 600 nm was added. e unresolved complex mixture was shaken at a speed of 180 r/min for 24 hours at room temperature using a shaker model THZ-82. e activity of bacterial was momentary halted by decreasing the temperature of the resulting mixture to about 2°C to 8°C a er every 24 hours.

Petroleum hta4du14 ce ebner9(v(v((rb(t)6hn)),wa)39(c)-3(a)9(rb)-9(m(t)lh 9(1u)iw6n(P)3(e)-3(t)5(r)8(o)3)12 (um)4(e o)12(f wa)19(t)6(e70(f)

e concentrations of what was le were also recorded. e highest amount removes was registered on day six, the point at which the rate of bioremediation was almost zero. A similar work [10] reported the maximum removed amount in this period of time. e observation from Table 1 showed that some PHs was also registered in the control experiment even though *Pseudomonas aeruginosa* were not present here. is suggested that, Lake Albert perhaps contained some PHs at the time when the water sample was picked. is agrees with the historic quotations that oil in Lake Albert (Uganda) was discovered following the seepage observations [11].

In Figure 1, the variation of amount of PHs removed and amount le in grams per litre with time in days were followed to generate Figure 2 that showed that bioremediation reaction followed second order though [12] suggested a rst order kinetics, Figure 2 demonstrated this.

Bioremediation rate and its half-life

To make the relationship between bioremediation rate in gram per day versus amount removed squared stand out, a graph in Figure 3 below was drawn that depicted a linear state of connectedness typical of second order reactions [13] of the form Rate= $c+(-k)A^2$ with a second order rate constant,-k, since removal of PHs were followed indicated by a negative sign. e constant, c, put into consi1 Tws5 (]TETEMC /Spa

In (Figure 2a) Regression for Bioremediation Rate/gday-1 vs. (Amount removed)^2/g^2/L^2

e relationship between bioremediation rate and the amount removed by microbes stood out as in Figure 2b indicating an upwardB 2nbMCI.EMC071 Tw 920a-<</0.ioe -5 (io)1(u)12 (12 (r i9 (es -3 (a)yp8 (s)411

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