DECAY RATE OF *ESCHERICHIA COLI* IN WASTEWATER: EFFECTS OF TEMPERATURE AND SUBSTRATE

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ABSTRACT

In intensive animal farming, wastewater produced has to be treated in oxidation ponds prior to release into the rivers. The decay of fecal bacteria in such nutrient rich wastewater in the tropics would provide knowledge on the retention period required for safe release. Therefore, the objective of this study was to investigate the effect of nutrients and temperature on the decay rate of *E. coli* in animal farm wastewater. A laboratory experiment was conducted on fresh animal farm wastewater at temperatures of 20°C and 30°C. Treatments investigated were undiluted wastewater (UW), diluted wastewater (DW), sterile wastewater (SW), and physiological saline (PS). Results show that at both temperatures of 20°C and 30°C, the trend of decrease in *E. coli* population was in decreasing order of UW>DW>PS>SW. Initial population of 10^6 cfu/ml in DW dropped to undetectable level in 11 days and 7 days respectively. However, in UW, it persisted longer where at 20°C, it was still detectable after 20 days and at 30°C it was undetectable after 11 days. There was an increase in the population of *E. coli* in SW resulting in final population that was higher than the initial population. Regression indicated that the decay of *E. coli* in UW and DW fitted the first order decay model well with R^2 of 0.94-0.98. Decay rates of *E. coli* ranged from 0.23 to 0.94 per day. Decay rates at 30°C were higher than decay rates at 20°C in all treatments. *E. coli* survived better in SW than PS due to the availability of nutrients. Higher decay rates in UW compared to SW indicates the role of predation and competition in the decrease of *E. coli* in wastewater. Results of this study indicate that if the temperature of the pond wastewater is maintained at 30°C, it would be safe to release the water after 11 days retention. However, if the temperature drops below that, longer retention period is required.

Keywords: *Escherichia coli*, decay rate, animal farming, wastewater

INTRODUCTION

In order to protect the environment, wastewater from intensive livestock farms are channelled into oxidation ponds (Ling *et al.*, 2007). This is an economical way of removing organic solids and nutrients (Metcalf & Eddy, 1991). It has also been reported to be important for the removal of microorganisms (Mayo, 1995). *E. coli* are indicators of microbial pollution and investigation on their persistence in nutrient rich wastewater will provide operators with information on the design of oxidation ponds and the management of wastewater treatment system before discharge. Wastewater in oxidation ponds has been reported to be high in nutrients such as nitrogen and phosphorus and organic matter (Ling *et al.*, 2007). Nitrogen was reported to affect the survival of *E. coli* in lake water (Lim & Flint, 1989) and the availability of food and nutrients and competition for them are the primary determinants of the rate of decay (Droste, 1997). With high