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Adsorption of Fecal Coliforms, *Escherichia coli*, in Soils of Sarawak

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ABSTRACT

In this study, fecal bacterial adsorption in three different soils (clay loam, silt loam, sandy loam) was investigated. A wild strain of *Escherichia coli* (*E. coli*) isolated from animal wastewater was used in the study. For adsorption kinetics study, adhesion of bacterial cells to soil particles was found to be immediate. Percent adsorption was found to be dependent on the initial concentration of *E. coli*. Results indicate that at low *E. coli* concentrations (below 10^3 cfu/ml), the percent adsorption was very much less in sandy loam than in silt loam and clay loam. However, as the bacterial concentration increased, all the soils tested displayed higher bacteria adsorption with maximum values of 99.9% for clay loam, 99.9% for silt loam and 99.7% for sandy loam. Soil with higher clay content (35.2 % and lower pH (pH 4.5)) had significantly higher capacity for adsorbing *E. coli*. Furthermore, *E. coli* concentration of 10^6 cfu/ml in suspension was found to decrease by 2 orders of magnitude in all the three soils. Therefore, land treatment of wastewater from animal farm lagoons should be considered to reduce microbial contamination of rivers.

Keywords: Adsorption, fecal coliforms, *E. coli*, soils, animal waste

INTRODUCTION

Animal waste is known to be a potential source of bacterial pathogens (Pell 1997). Direct discharge of animal wastewater or lagoon effluent could result in microbial contamination of surface water. Land treatment or utilization provides a viable option in the treatment of animal waste since animal waste is a good source of plant nutrient (Fuller and Warrick 1985). However, knowledge on interaction of bacteria with different types of soils especially in quantitative terms is far from complete. Therefore, further studies need to be conducted to investigate the adsorption of bacteria in different soils, thus avoiding those that are not capable of adsorbing fecal bacteria at waste disposal sites. Due to the difficulties involved in the identification of specific disease-causing bacteria or virus, *Escherchia coli* is widely used as an indicator of fecal pollution. Adsorption of *E. coli* in soil is a complex process. It depends on the surface charge of the organism and soil particles, and the soil solution. According to Marshall (1971), clay and organic matter are key soil components responsible for the adsorption of bacteria.