

DIE-OFF RATE OF *ESCHERICHIA COLI* AS A FUNCTION OF pH AND TEMPERATURE

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Abstract: *Escherichia coli* (*E. coli*) is a common indicator of fecal pollution of water and soil. To model bacterial die-off in the soil, knowledge of the relationship between bacteria and environmental factors need to be quantified. First order die-off model is commonly used to predict bacterial die-off in the environment. The die-off rate is a function of environmental conditions. PH and temperature are two key environmental factors affecting *E. coli* die-off in the soil. In this study, *E. coli* die-off in a soil was investigated in the laboratory under controlled temperatures and pH conditions. *E. coli* was isolated from pig waste, grown and inoculated in the soil. The population in the soil was determined for a period of three weeks. Results showed that pH and temperature significantly affected die-off rates. As pH decreases from 7 to 3, die-off rate increased. Die-off rates at 20°C are generally lower than those at 30°C. It was found that there was no significant difference between die-off rates at pH of 6 when compared with that at pH of 7. Simple linear regression shows that the fit of first order die-off model to the experimental data was good with 70% of the coefficients of determination, R^2 , of 0.90 and higher. Die-off rates were found to range from 0.07 d^{-1} to 1.60 d^{-1} . Between pH 3–5, analysis shows that there was no significant interaction between pH and temperature. Multiple linear regression indicated that both coefficients of temperature and pH are significant. Relationship of die-off rate as a function of pH was developed. Temperature correction coefficients between 20–30°C were found to be pH dependent.

Keywords: *E. coli*, die-off, survival, pH effect

1. INTRODUCTION

Animal waste is considered an underutilized resource and a key alternative utilization of animal waste is as a source of plant nutrient [1]. Animal manure application not only improved crop production but also improved soil properties by reducing surface runoff and soil loss [2]. However, animal wastes are also potential health risk due to possible presence of pathogens [3]. Therefore, proper management of animal waste is essential. Modeling can be used as a tool in management of animal waste. *Escherichia coli* (*E. coli*) is a common indicator of fecal pollution of water and soil. To model bacterial die-off in the soil, knowledge of the relationship between bacteria and environmental factors need to be quantified. First order die-off model is commonly used to predict bacterial die-