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EFFECT OF PREDATION ON SURVIVAL OF *Escherichia coli* IN PIGGERY WASTEWATER

THEN, Y.P., APUN, K. AND LING, T.Y.

Faculty of Resource Science and Technology, Universiti Malaysia Sarawak, 94300 Kota Samarahan, Sarawak
Email: kasing@frst.unimas.my

ABSTRACT

Ciliated protozoa had been reported to play an important role in removing bacteria from wastewater. Although there are studies done on predation of protozoa on bacterial or *Escherichia coli (E. coli)* survival, most of the studies were conducted in estuarine water and seawater with different salinity and indigenous microbiota. Therefore, this study was carried out to observe the effects of protozoa on *E. coli* survival in piggery wastewater under different temperatures. The survival of *E. coli* in piggery wastewater was examined at 3 different temperatures (20°C, 30°C, 35°C). The decline in the number of *E. coli* in wastewater was significantly greater in the presence of an indigenous protozoa community compared to sterile wastewater. The *E. coli* population decreased when the numbers of protozoa increased. The results indicated that when the population of *E. coli* dropped to the detection limit (10^1 cfu/ml), the number of protozoa still remained high at 10^2 to 10^3 unit per ml. Temperature also affect *E. coli* survival. It was observed that protozoa increased one order of magnitude in one day at 35°C, followed by two days in 30°C and three days at 20°C. Hence, the higher survival of *E. coli* at 20°C may partly be due to a slower protozoa multiplication at a lower temperature to reach a density that could cause an accelerated decrease in the *E. coli* population. Thus, protozoa play an important role in the decline of *E. coli* population at a higher temperature and could contribute to a reduction of fecal pollution of water resources.

INTRODUCTION

Protozoa are organisms that carry out all of their life functions within the single, complex eukaryotic cell. This includes *Paramecium*, *Euglena* and *Amoeba*. They are found living actively in nutrient-poor to organically rich waters and in fresh water varying between 0°C and 50°C. When food is enough and temperature is increased, rates of population growth increase (Fenchel, 1974).

Removal of bacterial carbon by protozoan community is important in production of good quality effluent. It was demonstrated that ciliated protozoa played an important part in removing bacteria from wastewater, contributing to the production of good quality effluents with low BOD (biochemical oxygen demand) and suspended solids (Curds and Cockburn, 1970). A study done by Laybourn-Parry *et al.* (1999) showed that heterotrophic nanoflagellates (<5 μm) played a significant role in removing bacteria from wastewater in lagoon. It was reported that they grazed greater proportion of bacterial biomass than ciliates and thus contribute greatly in removing bacterial carbon in sewage treatment system.

A few protozoa have been known to feed on bacteria actively, including flagellates and ciliates in estuarine water (Gonzalez, 1989). These include colpoda which actively feed on *E. coli* in freshwater (Levin *et al.*, 1992) and reduction of *E. coli* by grazing activities of amoebae in seawater (Gurijala & Alexander, 1990). Several species and taxa of ciliate have been identified as good indicators of effluent quality (Laybourn-Parry *et al.*, 1999).

Although there are studies done on predation of protozoa on *E. coli* survival, most of the studies were conducted in estuarine water (McCambridge and McMeekin, 1980). The applicability of seawater and estuarine waters studies to piggery wastewater is doubtful as the salinity and indigenous