Sunlight inactivation of faecal coliforms in domestic wastewater

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ABSTRACT

The relationship between sunlight effect, algal biomass and faecal coliform inactivation in wastewater pond treatment systems is still not clearly understood. Increased pH and dissolved oxygen concentration in treatment ponds results in an increased destruction of faecal coliforms. Increased algal growth however results in a decreased destruction of faecal coliforms due to light attenuation. Algae also releases variable amounts and types of organic matter at various rates and quantities depending on environmental conditions and this can either aid or retard faecal bacteria destruction. We investigated the effect of algal density on faecal coliform destruction under field conditions in sunlight and darkness and how this can be affected by light intensity. In darkness, increased inactivation of faecal coliform occurred with increasing algal density. Rates of decay of faecal coliforms were much faster in sunlight than in darkness even in the absence of algae. In sunlight, rates of decay of faecal coliforms increased with increasing algal density up to a chlorophyll-a concentration of 1.3 ± 0.1 mg/L after which rates of decay decreased. Increased decay rates of faecal coliforms occurred with increasing light intensity or light input. With decreased light input of 20% of 213 W/m², the optimum algal density for maximum faecal coliform decay decreased to a value which is 6–7 times the value of that under normal insolation of 213 W/m². It is recommended that in future studies relating to the assessment of performance and estimation of rate of Escherichia coli or faecal coliform inactivation, one of the parameters that need to be reported as well is the insolation.

Keywords: Algae; Insolation; Treatment; Waste stabilization ponds