

Augmented yeast-extract and diary-waste for enhancing bio decolourization of palm oil mill effluent using activated sludge

ABSTRACT

Colourants substances in palm oil mill effluent (POME) are carcinogenic, unfortunately, the commonly applied conventional activated sludge system has been unable to remediate these contaminants. The need for more efficient treatment approach is fundamental in order to sanctuary the environment. A novel start-up approach, which involves augmentation of yeast-extract and diary-waste as recipes added into activated sludge to remediate colourants concentration in POME was employed in this study. The decolourization performance obtained was compared with that of the conventional activated sludge operated under the same conditions. The augmented recipes that best sustained the active biomass was identified and then applied in the subsequent studies. Because of this, the acclimation duration drastically shortens to 31 days, as against 87 days of that of the conventional method. The swift acclimation was due to the adequacy and stability of the sludge active sites, which was successfully increased by 35.31% using the augmented recipe. The decolourization efficiency at steady aeration of 5 L/min and OLR of 0.895gCOD L⁻¹d⁻¹ using augmented sludge was 63.45%, which was far greater than 37% obtained by the conventional sludge. Monod Kinetic model excellently described the degradation process of both augmented and conventional sludge based on COD depletion with a respective R² value of 0.9923 and 0.9839. The calculated kinetic coefficients proved that microbial growth-substrate utilization rate of the augmented sludge was superior with biomass yield of 2.1142 mg MLVSS/mg COD. The significant improvement in the decolourization was attributed to the augmented recipes, which successfully enhanced the metabolic and xenobiotic activities of the active biomass.

Keyword: Aerobic-degradation; Bio-decolourization; Active biomass; Augmentation; Yeast-extract; Diary-waste; Kinetic coefficients