A generic stoichiometric equation for microalgae–microorganism nexus by using clarified domestic wastewater as growth medium

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\textbf{ABSTRACT}

Stoichiometric equations for microalgae–microorganism nexus culture were established by using 18 sets of experimental data from the literature where clarified domestic wastewater (CDWW) was used as a growth media. The best correlations between observed and calculated coefficients in the equations were 0.908, 0.878, 0.838, and 0.849 for reactors $R_1$, $R_2$, $R_3$, and the sum of three reactors, respectively. Then, each stoichiometric equation was generalized to quantitatively describe the reactions in each set of data for 18 different experimental conditions. By analysis, the most and second most sensitive limiting parameters were identified from the 18 stoichiometric equations. The formulas and equations were further upgraded to a generic form for a general organic growth medium (C$_x$H$_y$O$_z$N$_w$P$_f$). Microalgae–microorganism nexus was established by using the developed coefficients to depict the limited and balanced reactions. The study showed that nitrogen and phosphorus are required as additives in CDWW in order to gain a balanced microalgae–microorganism nexus for a higher yield of microalgae and microorganisms. For a balanced microalgae–microorganism nexus, the optimal nutritional molar ratio of C, N, and P in the CDWW growth medium was found to be 53:15:1.

\textbf{Keywords:} Microalgaee; Microorganism; Nitrogen; Phosphorous; Stoichiometric

1. Introduction

A model or stoichiometric equation is crucial in predicting the most sensitive parameter from a set of process influence parameters \cite{1,2}. With the assistance of experimental data from the literature, a model or stoichiometric equation can be used in preliminary studies ahead of small lab scale research experiments to reduce time, efforts, and cost of the laboratory-scale studies and to improve the trial-and-error method of

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