Nutrient recovery from food industry solid waste for cultivation of the microalga *Desmodesmus* sp. for production of alpha-linolenic acid

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The generation of food waste by the food processing industry poses significant environmental and economic challenges globally. This study investigated the potential of utilizing industrial food waste as a source of nutrients for cultivation of the microalga *Desmodesmus* sp. to produce value-added biomass rich in alpha-linolenic acid. The objectives of the study were to identify the type of food waste and dilution factor of food waste hydrolysate to maximize biomass and alpha-linolenic acid yields, and assess the efficacy of nutrient recovery. The current study is the first in reported literature to utilize industrial food waste for synthesis of microalgae-based alpha-linolenic acid. First, a screening experiment was performed for growth of *Desmodesmus* sp. in hydrolysates of brewery waste (BrW), biscuit waste (BiW), and Thriposha waste (TW) with four dilution factors; 25%, 50%, 75% and 100% (undiluted hydrolysate). Higher biomass yields were achieved in all waste types compared to the control medium (modified Bold's Basal media; 3N-BBM), with the maximum yield obtained using 100% TW. Thereafter, *Desmodesmus* sp. was cultured in photobioreactors using 100% TW, with a 3N-BBM control. The biomass growth rate and specific growth rate achieved in 100% TW hydrolysate were 0.503 g L^{-1} d^{-1} and 0.214 d^{-1} respectively, which were significantly higher than the control. Biomass analysis showed that a significantly higher lipid content was present in the 100% TW-cultivated biomass, suggesting a higher alpha-linolenic acid extraction potential. Nevertheless, further research on techno-economic feasibility assessment and toxicology analysis is required prior to large-scale adoption of this process.

Keywords: Food industry solid waste, microalgae cultivation, *Desmodesmus* sp., alpha-linolenic acid, nutrient recovery