Identification of a newly isolated microalga from a local pond and evaluation of its growth and nutrients removal potential in swine breeding effluent

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ABSTRACT

In this study, an alga which grew robustly in a local pond was purified and identified, and its growth and nutrients removal potential in swine breeding effluent at concentration of 0, 20%, and 50% dilution were evaluated. The results showed that the isolated alga was identified as Scenedesmaceae sp. with assistance of both DNA sequencing and morphological observation. Better growth curves were observed in 20% and 50% dilution with the growth rates being 0.275 and 0.279 d⁻¹, respectively, when compared with that in BG-11 medium. The maximum removal efficiencies of total phosphorus, COD, and ammonia nitrogen were 80.4, 37.1, and 98.2%, respectively, at the end of 12-day cultivation period. It is suggested that the isolated strain was highly promising for the ongoing efforts on mass cultivation of microalgae for treating swine breeding effluent coupled with biomass production.

Keywords: Identification; Growth; Nutrients removal; Swine breeding effluent

1. Introduction

Effluents from pig farming often contain high concentrations of nitrogen, phosphorus, and organic matter [1]. Serious environmental problems such as eutrophication of inland water body [2] or groundwater contamination [3] would be caused by direct discharge or improper treatment. There are some conventional biological disposal methods, including activated sludge process [4] and anaerobic treatments [5,6], could be adopted as the potential approaches, but the lower nutrients removal efficiency and higher energy inputs retarded widespread implementation in rural areas. In this context, it is crucial to develop and implement cost-effective technologies that can reduce discharge of nutrients into the watershed while increase farm profits for the establishment of sustainable farming [7]. Microalgae-based system grown in wastewater might be an alternative to solve the problem [8]. Microalgae could effectively assimilate the required organic matter and nutrients present in the wastewater for growth, and biomass production could serve as the replacement of the imported high-protein feed supplements [9]. Moreover, Mulbry et al. [10,11] pointed out that the annual energy input and cost of the projected system based on simple solar-powered