



# Potential biomass yield per phosphorus and lipid accumulation property of seven microalgal species



Yin-Hu Wu<sup>a</sup>, Yin Yu<sup>a</sup>, Hong-Ying Hu<sup>a,b,\*</sup>

<sup>a</sup> Environmental Simulation and Pollution Control State Key Joint Laboratory, School of Environment, Tsinghua University, Beijing 100084, PR China

<sup>b</sup> State Environmental Protection Key Laboratory of Microorganism Application and Risk Control (MARC), Graduate School at Shenzhen, Tsinghua University, Shenzhen 518055, PR China

## HIGHLIGHTS

- ▶ The minimal phosphorous contents of seven microalgal species were determined.
- ▶ Potential biomass yields per phosphorous of seven microalgal species were compared.
- ▶ Lipid/TAGs yields per phosphorous of these microalgae were compared.
- ▶ *Scenedesmus* sp. LX1 obtained the highest potential biomass/lipid/TAGs yield per P.

## GRAPHICAL ABSTRACT



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## ABSTRACT

The potential biomass yield per phosphorus and lipid/triglyceride (TAG) accumulation properties of seven microalgal species: *Scenedesmus* sp. LX1, *Chlorella ellipsoidea* YJ1, *Chlorella vulgaris*, *Chlorella sorokiniana*, *Chlorella pyrenoidosa*, *Dunaliella primolecta* and *Haematococcus pluvialis* were investigated. Among the tested species, *Scenedesmus* sp. LX1 obtained the smallest minimal phosphorus content in cell ( $Q_0$ ) and the highest potential biomass yield of 6100 kg-biomass/kg-P. After 12-day growth with intracellular phosphorus, *Scenedesmus* sp. LX1 accumulated about 30% lipid in biomass. Furthermore, the TAGs content per lipid of this strain (58.5%) as well as the lipid and TAGs yield per phosphorus (1800 kg-lipid/kg-P and 680 kg-TAGs/kg-P, respectively) were all significantly higher than that of any other species investigated in this study. Therefore, the phosphorus consumption to produce 1 kg biodiesel using *Scenedesmus* sp. LX1 as feedstock was lowest among the tested species.

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## 1. Introduction

Phosphorus has been considered as one of the most important limiting resources on the large-scale production of microalgal biofuel (Yang et al., 2011b). Phosphorus is also known as one of the essential elements for microalgal growth from early on. The

average phosphorus content of algal cell was demonstrated a long time ago, which was about 1% of dry cell weight equaling to 100 kg-biomass/kg-P. However, it still remains debatable that how much biomass production potential contained within per unit of phosphorus resource. Powell et al. (2009) investigated luxury uptake of phosphorus by microalgae in the waste stabilization ponds and found that the phosphorus content of algal cell could change in the range of 0.21–3.85%, that is, 476 kg-biomass/kg-P to 25.9 kg-biomass/kg-P in the term of biomass yield per phosphorus. In the previous study, *Scenedesmus* sp. LX1 was cultivated in BG11 medium at a light intensity of 1900–2200 lx, and a biomass

\* Corresponding author at: Environmental Simulation and Pollution Control State Key Joint Laboratory, School of Environment, Tsinghua University, Beijing 100084, PR China. Tel.: +86 10 62794005; fax: +86 10 62797265.

E-mail addresses: [hyhu@tsinghua.edu.cn](mailto:hyhu@tsinghua.edu.cn), [alips720@126.com](mailto:alips720@126.com) (H.-Y. Hu).