

The role of microtubules in microalgae: Inspirations for lipid accumulation and extraction

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Abstract

Microtubules have been verified to be able to regulate the precursors in microalgal cells. With the aim of testing the assumption that microtubule disruption could regulate precursors for complex organic matters and redirect carbon flow to promote lipid accumulation, *Chlorella sorokiniana* SDEC-18 was pretreated with different concentrations of oryzalin. Strikingly, microalgae, pretreated with 1.5 mM of oryzalin, accumulated 41.06% of lipid content which was 1.4 times higher than that without pretreatment, attributed to the cellular cross-talk in carbon partitioning induced by microtubule destruction. Furthermore, complete extraction of lipid was achieved after only one extraction steps in microalgae pretreated with 1.5 mM of oryzalin, that was because microtubules were depolymerized with oryzalin pretreatment, the cellulose synthase would be removed from membrane, and cellulose biosynthesis was then blocked, which enhanced cell fragility and thus easier to be broken. This study provided an important advance towards observation of microtubules in microalgae through immunocolloidal gold techniques combined with TEM, and microtubule destruction inducing efficient lipid accumulation and increased cell fragility expanded connotation of metabolic regulation by microtubules.

Keywords: Microalgae; Microtubule destruction; Lipid accumulation; Lipid extraction; Cell fragility.

USA and Copenhagen, Denmark to attend international conferences in 2017 and 2018.

Speaker Publications:

1. Jiang Liquan, Zhang Lijie, Nie Changliang, Pei Haiyan (2018). Lipid productivity in limnetic *Chlorella* is doubled by seawater added with anaerobically digested effluent from kitchen waste. *Biotechnology for Biofuels*. 3/14/2018, Vol. 11, p1-1. 1p.
2. Lijie Zhang, Juan Cheng, Haiyan Pei, Jianqiang Pan, Liquan Jiang, et al., Cultivation of microalgae using anaerobically digested effluent from kitchen waste as a nutrient source for biodiesel production. *Renewable Energy*. 115: 2018; 276-287.
3. Zhenn Xie, Haiyan Pei, Lijie Zhang, et al., Accelerating lipid production in freshwater alga *Chlorella sorokiniana* SDEC-18 by seawater and ultrasound during the stationary phase. *Renewable Energy*. 161: 2020; 448-456.

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Biography:

Lijie Zhang has completed her PhD at the age of 27 years from Shandong University. She has published 4 papers as the first author (Average impact factor was 6.06) in top journals and has completed 2 invention patents. Besides, she has gone to Miami,