

# Effects of LED Lighting on Growth of *Chlorella Pyrenoidosa*

Pei-Jyun Lin 林培鈞 (5112)

12/15/2021

## Outline

1. Introduction
2. Light wavelengths affected growth and lipid accumulation of microalgae
  - Wavelength
  - Cultivation methods
3. Light intensity affected growth and lipid accumulation of microalgae
4. Conclusion

## Abstract

*Chlorella pyrenoidosa* (*C. pyrenoidosa*), a type of lipid-rich green microalgae, features broad prospects for applications in such fields as health foods, biodiesel and so on. The light-utilizing efficiency of the algal cells is a critical factor that influences the biomass and lipid contents of photoautotrophic microalgae.

Chu *et al.* (2021) explored the effects of light emitting diode (LED) wavelength or two-phase culture of mixed light sources on the growth and lipid accumulation of *C. pyrenoidosa*. Cultivation with different LED wavelengths (white, purple, blue, green, yellow and red) under a light intensity of 200  $\mu\text{mol} / \text{m}^2 \cdot \text{s}$  showed that the red light gave the maximum biomass, and the green light gave the highest lipid content. The lipid contents of *C. pyrenoidosa* being treated under two-phases (first phase : red for 12 d, second phase : green light for 8 d , R→G) was higher than mixed LED (R:G = 3:7 or R:G = 7:3). Fatty acid (FA) analyses showed that 13 types FAs were detected and unsaturated FAs were over 50% (w/w) Additionally, although no difference in the FA composition of *C. pyrenoidosa* treated with different protocols was found, the absolute content did differ significantly, coinciding with that of the total lipids.

He *et al.* (2021) chose the red LED and the blue LED as the light source in order to increase the lipid content of microalgae as well as to reduce the energy consumption. The results showed that the highest biomass and lipid weight of *C. pyrenoidosa* were achieved under 5000lux light intensity, 8L:16D of photoperiod and red continuous LED light, which were 0.73 g/L and 0.552 g/L respectively. And it consumed 29.4 times less energy consumption for units of the total lipid content than that of tricolor energy-saving lamp. Furthermore, compared with intermittent LED lights, continuous LED lights are a better light source for *C. pyrenoidosa*.

## Reference

1

2 Chu B., Zhao J., Zheng H., Gong J., Chen K., Zhang S., Xiao G., He Y. (2021).  
3 Performance of LED with mixed wavelengths or two-phase culture on the growth  
4 and lipid accumulation of *Chlorella pyrenoidosa*. *International Journal of*  
5 *Agricultural and Biological Engineering*, 14(1), 90-96.

6 He Z., Han W., Jin W., Yang J., Gao S., Li S., Tu R., Han S., Chen Y., Zhou X. (2021).  
7 Cultivation of *Scenedesmus obliquus* and *Chlorella pyrenoidosa* in municipal  
8 wastewater using monochromatic and white LED as light sources. *Waste and*  
9 *Biomass Valorization*, 12, 4873–4883.