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High level lipid production by a novel inulinase-producing yeast *Pichia guilliermondii* Pcla22

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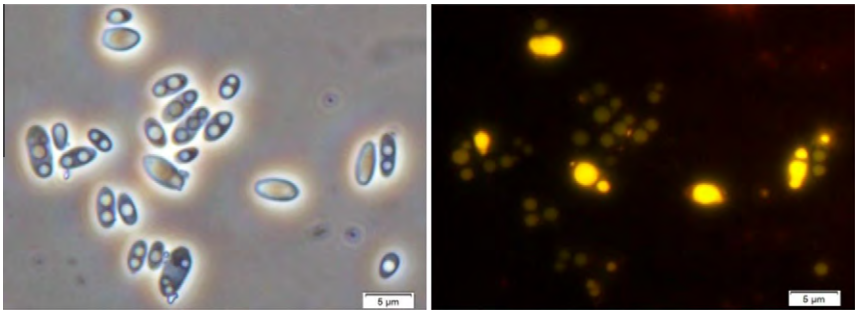
HIGHLIGHTS

- The inulinase-producing yeast strain Pcla22 of *Pichia guilliermondii* was obtained.
- Lipid content in the yeast cells cultivated a flask reached 55.2%.
- 60.6% of lipid was obtained after the fed-batch fermentation.
- Many lipid bodies were produced in the yeast cells.

GRAPHICAL ABSTRACT



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ABSTRACT

In this study, an inulinase-producing yeast strain Pcla22 of *Pichia guilliermondii* was identified. It was found that the yeast strain Pcla22 could produce higher amount of oil and more lipid bodies in its cells than any other yeast strains tested in this study. Under the optimal conditions, 60.6% (w/w) of lipid based on cell dry weight, 20.4 g/l of the dry cell mass, SCO produced per g of consumed sugar of 0.19 g/g and biomass produced per g of consumed sugar of 0.32 g/g were obtained in the culture of the yeast strain Pcla22 after 96 h of the fed-batch fermentation. Over 79.8% of the fatty acids from the yeast strain Pcla22 grown in the oil production medium containing inulin was $C_{16:0}$ and $C_{18:1}$, especially $C_{18:1}$ (57.9%). The biodiesel obtained from the produced lipid could be burnt well.

1. Introduction

In recent years, many researchers have paid much attention to single cell oil production by different microorganisms as the lipids extracted from the oleaginous microorganisms can be transformed into biodiesel by chemical ways or biological ways (Helwani et al., 2009). It has been well documented that biodiesel has many advantages over the conventional diesel because of its biodegradable, non-toxic, and essentially free of sulfur and aromatic components (Helwani et al., 2009). The yeast lipids were also used as substitutes of high added value exotic fats (e.g., cocoa butter) (Papanikolaou and Aggelis, 2011b). It has been known that many bacteria, filamentous fungi, yeasts and algae are oleaginous ones and can produce over 30% (w/w) lipid in their cells (Meng et al., 2009). However, it has been found that the oleaginous yeasts are the better ones because of rapid unicellular growth, high cell mass, high content of lipid, easily genetic modification, no endotoxin and easily large scale fermentation (Zhao et al., 2010a,b). To date, *Yarrowia lipolytica*, *Rhodosporidium toruloides*, *Lipomyces starkeyi*, *Trichosporon fermentans*, *Rhodotorula mucilaginosa*, *Trichosporon capitatum*, *Apiotrichum curvatum*, *Candida curvata*, and *Cryptococcus curvatus* have been

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