TITLE: EFFECTS OF CULTURE CONDITIONS FOR LIPID PRODUCTION IN *RHODOTORULA SLOOFFIAE* IN80 AS BIODIESEL FEEDSTOCK

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ABSTRACT:

Lipids found in vegetable oils, animal fats or microbial cell are a main candidate as a biodiesel precursor because they are chemically similar to the alkanes that make up diesel. Oleaginous yeasts are especially advantageous due to their fast growth, store large quantities of lipids and robust culture stability. The lipid content and their composition vary in response to growth conditions. This study aimed to optimize culture conditions favorable to growth and accumulation of lipids in the yeast *Rhodotorula slooffiae* IN80. The yeast was cultured in a medium that induces lipid storage changing sources of nitrogen (peptone, urea and ammonium chloride) and carbon (glucose, glycerol and xylose) in order to get the most appropriate sources. Growth was assessed by measuring the optical density which was related to the number of cells per ml and biomass was obtained by gravimetry. The quantification of lipid was performed by Nile Red fluorescence using a standard curve for triolein. The yeasts cultured in nitrogen organic sources had the highest growth. The lipid production reached 5.9 g/L when the cultivation was performed in urea. Therefore, both lipid productivity and yield were higher in urea. When cultured in glucose, yeasts obtained a higher biomass. However, lipid accumulation reached 86% in glycerol, with biomass of 12.47 g/L. On the 6º day of cultivation, the productivity was higher in glycerol. Due to these results, urea and glycerol were selected for the optimization process. A fractional factorial design with four variables (carbon source concentration, C/N ratio, temperature and pH) was done. The temperature and pH were those that most influenced the growth, inhibiting it at higher values. As lipid content remained high, a rotational central composite design was performed to increase biomass in glycerol. In this design, we studied the effect of carbon source concentration and C/N ratio, keeping the temperature and pH constant in 30°C and 6.0, respectively. The maximum biomass was 23.16 g/L, 10 g/L higher than that obtained in the initial experiment. The lipid production was optimal in C/N 239.47, with glycerol concentration level of 71.86 g/L, reaching a productivity of 0.071 g/L/h (58% more than that found in non-optimized conditions). The values of the optimized parameters significantly improved growth and lipid production by the yeast *R. slooffiae* IN80 and they have proven to be economical due to lower concentration of carbon and nitrogen sources.

Keywords: biodiesel, oleaginous yeasts, lipid, *Rhodotorula slooffiae*

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