
Potensi Lipid dari Khamir *Rhodotorula* sebagai Penurun Kolesterol

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Reducing dietary saturated fatty acid intake and increasing unsaturated fatty acid intake would decrease the concentration of low-density-lipoprotein (LDL), and decrease the triacylglycerol level significantly. It was suggested that higher intake of unsaturated fatty acid would substantially reduced risk of coronary heart disease. Oleic acid is known to have profound effect on reducing LDL cholesterol compared to linoleic acid. It is predicted that tuna and salmon fishes as sources of commercially omega-3 unsaturated fatty acids will be insufficient to meet human nutritional needs in the future. There may also be a significant problem for pregnant women consuming fish oil supplement, or fishes with mercury accumulation. In this regard, there is a need for new sources of these unsaturated fatty acid. Among the various oleaginous yeasts, the genus *Rhodotorula* is most potential because it can accumulate lipid. Several publications stated that species of *Rhodotorula* differ in lipid contents, and differ also in saturated and unsaturated fatty acid composition.

The objective of this study is to obtain yeast strains with lipid and highest unsaturated fatty acid contents, using growth curve determination to obtain cell biomass/dry weight, total lipid extraction and analysis of saturated and unsaturated fatty acid composition from 16 strains of *Rhodotorula*.

Sixteen yeast strains isolated from several substrates in Pulau Rambut Nature Reserve, Muara Angke Nature Reserve, Teluk Jakarta dan Gunung Halimun National Park were used in this study. They were *Rhodotorula acheniorum* (1 strain), *R. glutinis* (1 strain), *R. minuta* (5 strains), *R. mucilaginoso* (5 strains), *R. nothofagi* (1 strain), and *Rhodotorula* sp. (3 strains).

Macroscopic observation on colonies and microscopic observation on cells (size, shape, type of budding, cell arrangement) of *Rhodotorula* grown on Potato Dextrose Agar (PDA) or Yeast Malt Agar (YMA) with 1.5% NaCl were carried out. Estimation of cell number in inoculum for fermentation was obtained by cell enumeration of strains grown in YMA for 2 days, at room temperature. The inoculum was used for fermentation to determine growth curve by using basal medium containing macro and minor elements with added glucose and yeast extract. Cell enumeration was carried out by using total plate count (TPC) every 24 hour and pH of fermentation medium was measured. At the end of fermentation, at 72-hour, the culture was centrifuged to obtain the cell biomass. Based on the growth curve, the cell biomass was harvested at the end of logarithmic or early stationary phase. Cell biomass was dried in the oven, or lyophilised. Dried cell biomass was used for extraction of total lipid by using n-hexan. Analysis of saturated and unsaturated fatty acid composition was carried out by using gas chromatography.

Macroscopic observation of colonies of 16 yeast strains of *Rhodotorula* showed that these strains have similar colour, generally red, or red-orange, or orange, and mucoid. Microscopic observation of cells showed that the cells of these strains are globose to semi globose, and ellipsoidal. Cell enumeration showed that the yeast strains have 10^8 cell/ml grown in PDA for 2 days, at room temperature. At the start, the medium pH was 6 and then dropped to 2 at the end of fermentation.

Determination of growth curve showed that the yeast strains generally reached logarithmic phase at 24-hour to 72-hour. The harvested dried cell biomass after 72-hour fermentation ranged from 0,5 g/200 ml to 2,62 g/200 ml fermentation medium. Extraction of total lipid from dried cell/ 200 ml medium showed that total lipid contents were 0–4,68%. Two strains produced highest total lipid, *R. nothofagi* UICC Y-253 (4,682% per 0,416 g biomassa/200 ml) and *R. acheniorum* SD4233 (4,354% per 0,7 g biomassa/200 ml) respectively. Analysis of fatty acid composition with gas

chromatography showed that the yeast strains of *Rhodotorula* differed in saturated and unsaturated fatty acid contents. The saturated fatty acid contents detected in cell biomass of *Rhodotorula* were lauric acid (0–1,267%), miristic acid (0–7,598%), palmitic acid (0–41,809%), and stearic acid (0– 7,262%). The unsaturated fatty acid contents detected in cell biomass of *Rhodotorula* were oleic acid (0–75,083%), and linoleic acid (0–53,249%). Three strains have higher oleic acid contents, *R. mucilaginosa* UICC Y-136 (75,083%), *R. mucilaginosa* UICC Y-116 (74,828%), and *R. mucilaginosa* UICC Y-283 (73,803%) respectively.