

## The potential of rhodotorula graminis tistr 5124 for synthesis of polyhydroxyalkanoate (pha) by limitation of a phosphorus and nitrogen source

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### Abstrak

Polyhydroxyalkanoate (PHA) is one of the alternatively biodegradable plastics which can be synthesized from a particular micro-organism after the fermentation process, considering the optimization of nutrients. In this research, the yeast strain *Rhodotorula graminis* TISTR 5124 was selected to be fermented with a carbon source in the standard nutrient in order to conduct a preliminary study on the best conditions for this yeast in PHA production. The growth rate curve of yeast in the composition of imbalanced nutrients, i.e. the limitation of phosphorus and nitrogen, was also investigated and compared with another sample cultured in standard nutrients. Experimental results indicated that the condition that gave the maximum growth rate of this yeast strain was a P-limited condition at 81 hours, whereby the cell number of  $3.1 \times 10^9$  cells/mL was obtained and corresponded to the optical density (OD) of 0.95 measured at a wavelength of 600 nm. The synthesized PHA extracted from yeast cells after 81 hours of incubation was examined by Fourier transform infra-red (FT-IR) and nuclear magnetic resonance ( $^1\text{H}$  NMR) spectroscopy. The results indicated stretching vibrations similar to the copolymer PHBV (or a PHA derivative). Maximum PHA content of 54.4% was found in the P-limited condition which corresponded to a PHA yield of 65.1 (g/g-total sugar consumed) in which the yeast consumed the least glucose amount of 3.2 g/L, but grew the most rapidly. *Rhodotorula graminis* TISTR 5124 is therefore promising as a good candidate for alternatively biodegradable plastics, considering the potential to produce PHA and its derivatives. This process can be beneficial as an option to replace conventional plastics in the future.