**Morphology Analysis of Wild-type *Saccharomyces Cerevisiae* by Using Flow Particle Image Analyzer**

Kento Hyodo, Yuto Harada, Tomoyuki Nakagawa, Teppei Imaizumi,
Methavee Peanparkdee and Satoshi Iwamoto\*

 *Faculty of Applied Biological Sciences Gifu University
1-1,Yanagido,Gifu  501-1193, Japan*

*\*Corresponding author:**isatoshi@gifu-u.ac.jp*

**Highlights**

* The particle size and circularity of wild-type *Saccharomyces cerevisiae* were calculated.
* *Saccharomyces cerevisiae* could be classified as budding and non-budding by the images.
* The ratio of budding yeast caluculated from the imagies would be a benchmark in culture.

**1. Introduction**

Fermatation processes in food industries are one of the most important key steps to determine the quality of the food. It has been reqired to set an good parameter to moniter the fermatation processes. The growth of *Saccharomyces cerevisiae*, widely used for fermentation, which affects their shapes and sizes, depends on various conditions such as incubation time, oxygen concentration, pH, and temperature. This study aimed to evaluate the optimum growth conditions of wild-type Saccharomyces cerevisiae by using simple, easy, and rapid technique, namely Flow Particle Image Analyzer (FPIA-3000) which could provide the image of individual particle of wild-yeast in short time. In this study, the effect of incubation time, oxygen concentration and ethanol concentration in culture on the growth pattern of yeast was focused and evaluated by FPIA-3000.

**2. Methods**

*Saccharomyces cerevisiae* strain BY 4741 was grown in YPD medium (2% high polypeptone, 1% yeast extract and 2% glucose). In order to evaluate the effect of oxygen concentration on molphology of microorganisms, the wild type yeast was grown in YPD medium and incubated under 2 different conditions described below.
Condition 1: static culture in a closed vessel with an AnaeroPack (anaerobic).
Condition2: shaking culture in an Erlenmeyer Flasks with baffles(aerobic).
After incubation, a 5.0 ml of sample was applied to FPIA to obtain image parameters of the samples. Gas chromatography was used to determined the ethanol concentration of the sample in culture (aerobic condition).

**3. Results and discussion**

The total number, particle size and circularity of BY 4741 in culture could be calculated from the obtained images(Figure 1). From these results, BY 4741 grew under anaerobic and aerobic condition at different incubation time showed different total number, particle size and circularity. BY 4741 under aerobic condition had a higher total population than that grown under anaerobic condition. BY 4741 could be classified as budding and non-budding by the degree of circularity calucylated from image data. The budding yeast had a low degree of circularity (< 0.95), whereas the non-budding yeast exhibited a high degree of circularity (> 0.95). The ratio of budding yeast under both conditions increased with increasing incubation time. However, BY 4741 grown under anaerobic condition showed a slower rate of budding than that grown under anaerobic condition. Concentration of ethanol was increasing rapidly just after the total number increasing in the aerobic conditions. The FPIA-3000 is an appropriate technique which can also be applied to monitor the growth pattern of wild-yeast under various growth conditions.



**Figure 1.** Morphology analysis of *Saccharomyces cerevisiae* strain BY 4741.

**4. Conclusions**

The particle size and circularity of *Saccharomyces cerevisiae* were calculated. *Saccharomyces cerevisiae* could be classified as budding and non-budding by the images analysis. The ratio of budding yeast caluculated from the imagies would be a benchmark in culture.

**References**

1. T. Komabayashi, L. Spångberg, J. Endodontics. 34 (2008) 94-98.