

A New Tool for Quantitation of Yeast Cells

Yeast counts and viability are critical factors for the fermentation quality of many kinds of food production such as wine, beer, cheese and etc. Yeast counting methods are important elements of the brewing process. Traditional methods, such as hemocytometer and methylene blue staining are inaccurate and the slide culture requires long incubation time. For these reason, we developed the C-Reader cell analysis system for yeast cell counting. It can provide fast, accurate and high quality experimental result.

Laboratory Scale Fermentation of Beer

Micro brewery kit was purchased form Mr. Beer (Battle East Sussex, United states). Brewing was made by manufacturer's manual. Yeast cells were grown at room temperature. Samples were taken every 24 hours for two weeks and then periodically analyzed by the C-Reader cell analysis system.

Stain Solutions of C-Reader

The C-Reader determines the total yeast number by staining yeast DNA with a fluorescent dye, propidium iodide (PI). PI stains DNA of non-viable cells which have the permeable cellular membrane.

In order to measure the total yeast number, the plasma membrane of all the yeast cells must be disrupted to render all the nuclei susceptible to stain with PI. The disruption and stain are easily performed by the treatment of CRS-TY1 and CRS-TY2. For non-viable cell counting, two solutions were provided: CRS-NY1 and CRS-NY2 that stain DNA and stabilize cells.

C-Reader Cell Analysis Assay

Yeast cell samples were stained using the following procedure. The sample concentration can be ranged from 5×10^3 to 1×10^7 cells/ml. For total cell counting, 50 μ l of yeast sample was added to the 50 μ l of CRS-TY1 and then the 50 μ l of CRS-TY2. The sample was mixed thoroughly by vortex mixer. After mixing, 20 μ l of the sample was loaded onto the C-Reader chip as shown in Fig. 2. For non-viable cell counting, two stain solutions, CRS-NY1 and CRS-NY2 were used with the same procedures as described above. Within 1.5 min, total and viable cell counting in sample was measured by the CounterStar Software as described in the user's guide. Fig. 3 shows the fluorescence image of stained yeast cells and the CounterStar counts the cells from that image automatically.

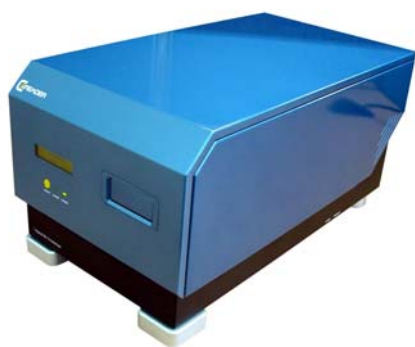


Figure 1. C-Reader : cell analysis system



Figure 2. Disposable plastic chip for accurate cell number counting

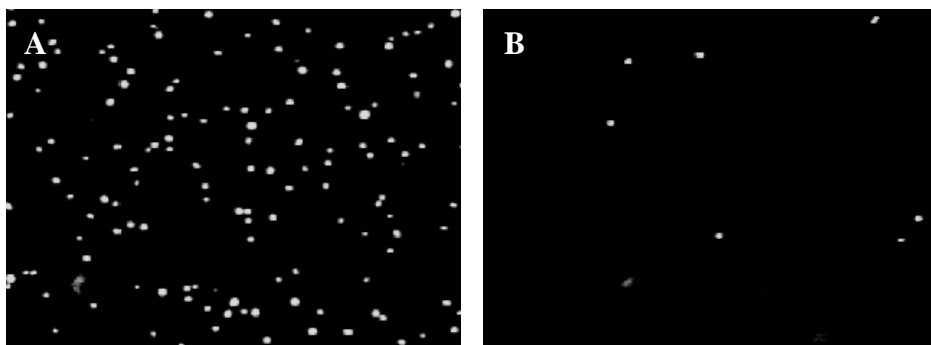


Figure 3. Fluorescence image of yeast cells. A: Total yeast cells. B: Non-viable cells.

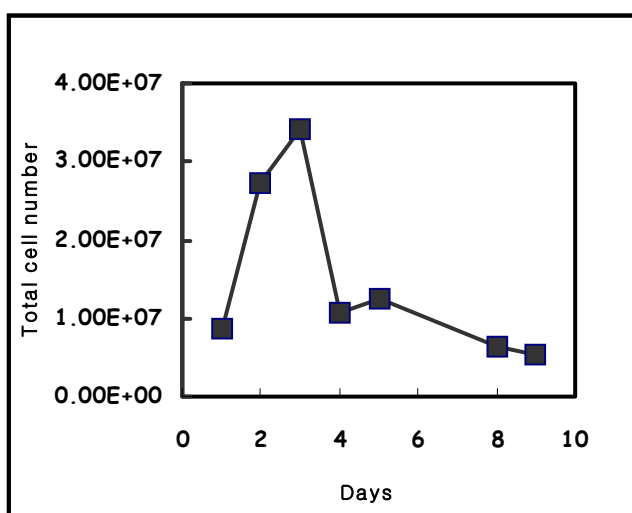


Figure 4. Fermentation tracking by C-Reader cell analysis system.

Results

Fluorescence image of yeast cells was captured using the C-Reader cell analysis system. Fig. 3 shows total yeast cells and non-viable cells. Yeast cell growth during laboratory scale fermentations was measured in the C-Reader cell analysis system (Fig. 4).

The C-Reader cell analysis system provides a rapid, easy and accurate method to monitor yeast growth and check the viability during the fermentation.



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