

## Production of *Saccharomyces cerevisiae* JUL3 Cell Mass using Molasses and Corn Steep Liquor

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### Objectives

*Saccharomyces cerevisiae* JUL 3 produced highly branched  $\beta$ -glucan was isolated from *S. cerevisiae* JH (Hensen1883, wild type) through UV mutagenesis and laminarinase resistance. The optimization of culture medium (molasses and corn steep liquor) was performed by using response surface methodology (RSM) for the production of  $\beta$ -glucan by *S. cerevisiae* JUL3. In a 2.5L stirred tank reactor (STR), some operating conditions were optimized under the batch culture. For the production of high cell mass, feeding media concentration and feeding rate were tested in a fed-batch culture.

### Materials and Methods

Seed media was composed of 1.0% yeast extract, 2.0% bacto-peptone and 2.0% glucose. Seed was cultured at 30 °C for 16 hours in a shaking incubator with 200 rpm. The composition of main medium (pH 6.0) was as follows: 6.4 % molasses, 17% corn steep liquor(CSL), 0.1% MgSO<sub>4</sub> · 7H<sub>2</sub>O, 0.5% KH<sub>2</sub>PO<sub>4</sub>. Main culture was inoculated with 2.0% seed culture. In a 2.5ℓ stirred tank reactor, operation condition was 30 °C, 1.0 vvm and 200 rpm. For the fed-batch culture, initial operating volume was 1.2ℓ and feeding media (molasses solution) were fed at the rate of 10, 15 and 20 ml/h after 18h cultivation. Dry cell weight was determined gravimetrically.

### Results and Discussion

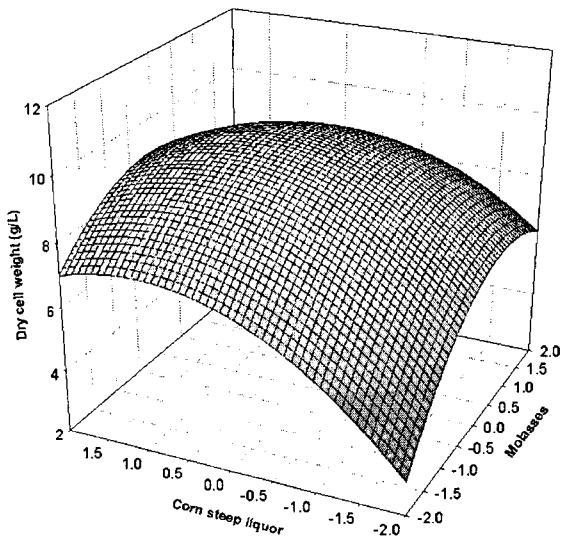
Optimal concentration of molasses and CSL were found to be 6.4% and 17% respectively. The maximum cell concentration was 9.9 g/ℓ at 20 h cultivation. optimal agitation speed and aeration rate in a 2.5ℓ STR were 350 rpm and 1.5 vvm, respectively. In fed-batch culture, maximum dry cell weight (95.7 g/ℓ) was obtained when 50% molasses solution as feeding media and 10 ml/h of feeding rate were used.

**Table 1. Real and coded values of the factors used in the experimental design**

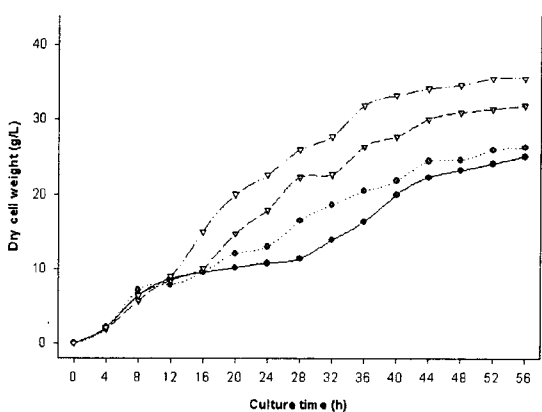
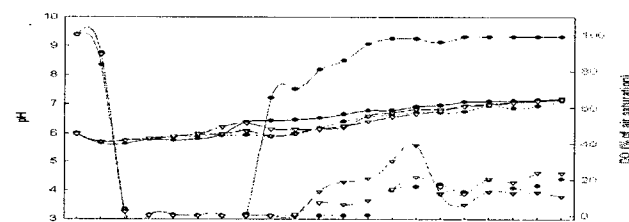
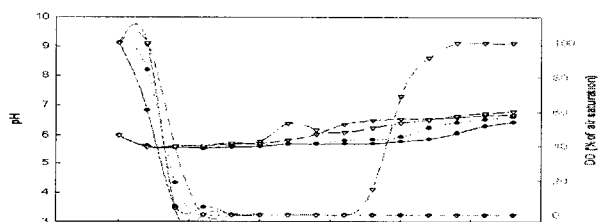
| Factors  | Symbol             | Coded values |    |    |    |        |
|----------|--------------------|--------------|----|----|----|--------|
|          |                    | -1.414       | -1 | 0  | +1 | +1.414 |
| Molasses | X <sub>1</sub> (%) | 3.17         | 4  | 6  | 8  | 8.83   |
| C.S.L    | X <sub>2</sub> (%) | 7.93         | 10 | 15 | 20 | 22.1   |

**Table 2. Experimental design and results of the 2<sup>2</sup> full factorial central composite design**

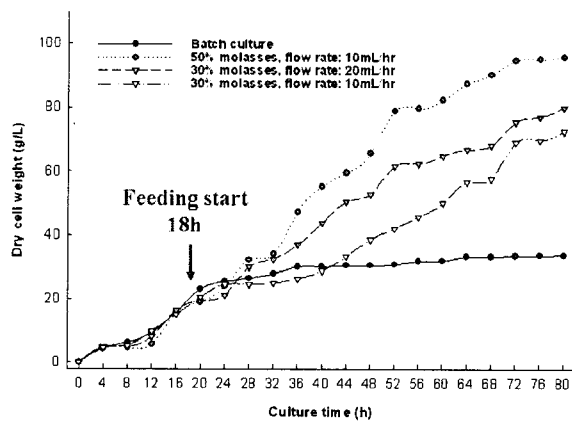
| Runs | Coded values   |                | Dry cell weight (g/L) |
|------|----------------|----------------|-----------------------|
|      | X <sub>1</sub> | X <sub>2</sub> |                       |
| 1    | +              | +              | 9.468544              |
| 2    | +              | -              | 8.504162              |
| 3    | -              | +              | 9.013647              |
| 4    | -              | -              | 7.285038              |
| 5    | + 1.414        | 0              | 9.122822              |
| 6    | - 1.414        | 0              | 8.049265              |
| 7    | 0              | + 1.414        | 9.377564              |
| 8    | 0              | - 1.414        | 7.867307              |
| 9    | 0              | 0              | 8.213028              |
| 10   | 0              | 0              | 9.923441              |
| 11   | 0              | 0              | 9.104626              |
| 12   | 0              | 0              | 8.249420              |



**Fig. 1. Three-dimensional response surface plot of the central composite design experiment.**



**Fig. 2. Time course of DO, pH, dry cell weight in a 2.5L batch STR at 30 °C, 1 vvm, pH 6.0.**



**Fig. 3. Fed-batch culture with constant feeding rate in a 2.5L STR at 30 °C, 350 rpm, 1.5 vvm, and pH 6.0.**

**Acknowledgement**

This work is supporting by Biogreen 21 (200504010347981870300) through the Rural Development Administration.