

Microbial production of ethanol by *Saccharomyces cerevisiae* NCIM -2096 exposed to sodium azide

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Abstract : The efficacy of sodium azide on microbial production of ethanol by *Saccharomyces cerevisiae* NCIM -2096 has been assessed. It has been found that the mutagen under trial, i.e., sodium azide at 6×10^{-5} M molar concentration enhances the microbial production of ethanol by *Saccharomyces cerevisiae* NCIM -2096 to an extent of 10.204% higher in comparison to control fermentor flasks, i.e., 5.88 ml/100mL in 58 hrs of incubation period, 4.6 pH and 31°C temperature with 24% (w/v) molasses solution.

(Keywords: Molasses, ethanol, sodium azide *Saccharomyces cerevisiae* NCIM -2096)

Introduction

The influence of different chemical mutagens in different fermentations bioprocess has been investigated by a number of research workers¹⁻³. A large number of chemical physical mutagens are recorded as an excellent agent for different microbes and microbial process.⁴⁻⁶ Sodium azide has been reported by a number of research workers in different biotic processes⁷⁻¹³.

The present study was undertaken to assess and analyse the microbial production of ethanol by *Saccharomyces cerevisiae* NCIM -2096 exposed to sodium azide.

Experimental

The composition of the production medium for microbial production of ethanol by *Saccharomyces cerevisiae* NCIM -2096 is prepared as follows :

Molasses : 24% (w/v), Malt-Extract : 1.75% , Yeast-Extract : 1.75%, Peptone : 1.75% Distilled

water : To make up 100 ml, pH : 4.6, Distilled water was added to make up the volume up to '100 ml'. The pH of the medium was adjusted to 4.6 by adding requisite amount of lactic acid.

Assay method :

Ethanol¹⁴ formed and molasses¹⁵ left unfermented was estimated colorimetrically.

Results and Discussion

The influence of sodium azide on ethanol production by *S. cerevisiae* NCIM -2096

The data recorded in the table-1 shows that sodium azide has stimulatory effect on ethanol production by *Saccharomyces cerevisiae* NCIM -2096. The maximum yield of ethanol, i.e., 6.48 ml/100 ml in the presence of sodium azide was observed at 6.0×10^{-5} M molar concentration in 58 hours of optimum incubation period which is 10.204% higher in comparison to control fermentor flasks, i.e.; 5.88ml/100ml in the same times course and other same experimental parameters.

The higher molar concentrations of sodium azide were not much favourable for the ethanol production by *Saccharomyces cerevisiae* NCIM -2096. So the gradual addition of the mutagen sodium azide after certain concentrations were not beneficial for ethanol production by *Saccharomyces cerevisiae* NCIM -2096.

It has been observed that molar concentration of the mutagen, i.e., sodium azide from 1.0×10^{-5} M to 6.0×10^{-5} M enhances the yield of ethanol to an order being 0.680%, 1.020%, 2.210%, 4.421%, 7.653%, and 10.204% higher in comparison to control flasks.

Table - 1
Microbial production of ethanol by *Saccharomyces cerevisiae* NCIM-2096
exposed to Sodium Azide

Concentration of Mutagen used A X 10 ^{-x} M	Incubation Period in hours	Yield of ethanol* in ml/100 ml	Molasses sugars* left unfermented in g/100 ml	% Difference in yield of ethanol after 58 hours
Control	58	5.88	2.489	—
1.0 × 10 ⁻⁵ M	58	5.92	2.338	+0.680
2.0 × 10 ⁻⁵ M	58	5.94	2.314	+1.020
3.0 × 10 ⁻⁵ M	58	6.01	2.359	+2.210
4.0 × 10 ⁻⁵ M	58	6.14	2.187	+4.421
5.0 × 10 ⁻⁵ M	58	6.33	1.927	+7.653
6.0 × 10 ⁻⁵ M**	58	6.48** *	1.885	+10.204
7.0 × 10 ⁻⁵ M	58	6.20	2.059	+5.442
8.0 × 10 ⁻⁵ M	58	6.01	2.314	+2.210
9.0 × 10 ⁻⁵ M	58	5.94	2.386	+1.020
10.0 × 10 ⁻⁵ M	58	5.91	2.458	+0.510

* Each value represents mean of three trials. ** Optimum concentration of the chemical mutagen used. *** Optimum yield of ethanol in 58 hours. (+) Values indicate % increase in the yield of ethanol in comparison to control. Experimental deviation (±) 1.5–3%.

M/1000 solution of sodium azide was prepared and 1.0, 2.0, 3.0, 4.0, 5.0, 6.0, 7.0, 8.0, 9.0, and 10.0 ml of this solution was added to the fermentor-flasks of 1st to 10th sets respectively.

It has been observed further that after optimum concentration, i.e; 7.0 x 10⁻⁵ M, the addition of the same mutagen, i.e. sodium azide to the production medium causes fall in the yield of ethanol gradually and reached to 0.510%. However,

at all the experimental concentrations of mutagen, i.e. sodium azide used, the yield of ethanol has been found higher in comparison to control fermentor flasks.

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