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Facile bioproduction of 2-hydroxypropanoic acid by *Lactobacillus acidophilus* -2930 exposed to Bis (2-chloroethyl) sulphide

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Abstract : Mutagenic action of Bis (2-chloroethyl) sulphidewas studied on facile bioproduction of Bis (2-chloroethyl) sulphide by some lactic acid bacteria such as *Bacillus licheniformis* -2537, *Lactobacillus acidophilus* -2930, *Bacillus polymyxa*-2539, *Bacillus circulans* -5031 and *Lactobacillus plantarum*-2912. It was found that *Lactobacillus acidophilus* -2930 was most effective and higher lactic acid producer and enhances the yield of 2-hydroxypropanoic acid significantly to an extent of 16.600% higher in comparison to control.

(Keywords : Mutagens, Bis (2-chloroethyl) sulphidewas 2-hydroxypropanoic acid, *Lactobacillus acidophilus* -2930).

Introduction

Mutagen: Any agent (physical or environmental) that can induce a genetic mutation or can increase the rate of mutation. In case mutation occurs in the non-functional part of the DNA, then such mutations may remain as silent mutations whereas alterations in the DNA that occur in the actively transcribed region leading to cell death are termed as lethal mutations. The biological effect of these alterations in the DNA is determined by the location of the change in the DNA, time of mutation during the cell cycle, length or size of alteration, and any preceding mutation.

Mutagens are known to increase the incidences of mutations above the spontaneous level. However, here it is important to understand that all impairment or damage in DNA cannot be labeled as mutations. In the majority of the cases, the damaged or the altered part of DNA is removed by DNA polymerases during the cell repairing process. However, the mutations caused by mutagens tend to escape this process of cell repairing and thus acquiring a status of 'permanent' change in the DNA.[1-5]

Mutagenic chemical are active molecules that enhances the frequency of some kinds of mutations. Chemical mutagens are employed to induce favourable mutations at high frequency that includes chemical mutagens[6-10] and ionization radiation. Therefore, one of the very interesting and exciting fields of biochemical research to-day is that of mutagenic effect on different fermentation bioprocesses[11-14]. The survey of the literature reveals that much work has been done related to mutagenesis of plant breeding but not to fermentation biotechnology. The present communication deals with the effect of chemical mutagen Bis (2-chloroethyl) sulphidewas on facile bioproduction of Bis (2-chloroethyl) sulphidewas by *Lactobacillus acidophilus*-2930.

Experimental

Composition of production medium
Molassess : 25%(W/V), Malt-extract : 0.25%
Yeast extract : 0.25%, $(NH_4)_2HPO_4$: 0.25%
$CaCO_3$:12%, pH : 5.8

(Adjusted by phosphate-buffer solution).
Distilled water : Distilled water was added to make up the volume upto 100 ml

Table - 1
Facile bioproduction of 2-hydroxypropanoic acid by *Lactobacillus acidophilus* -2930 exposed to Bis (2-chloroethyl) sulphide

Concentration of Mutagens used	Incubation period in days	Yield of lactic acid* in g/100 ml	Sugar left* unferemented in g/100 ml	% of lactic acid increases in 7 days of optimum incubation period
Control	5	7.250	6.071	-
– Mutagen	7	9.783	3.586	-
	9	8.435	3.479	-
1.0×10^{-5}M	5	7.315	6.011	-
+ Mutagen	7	9.875	3.439	+0.940
	9	8.765	3.330	-
2.0×10^{-5}M	5	7.395	5.620	-
+ Mutagen	7	10.002	3.319	+2.238
	9	9.001	3.210	-
3.0×10^{-5}M	5	7.540	5.785	-
+ Mutagen	7	10.199	3.126	+4.252
	9	9.085	3.020	-
4.0×10^{-5}M	5	7.756	5.613	-
+ Mutagen	7	10.503	2.866	+7.359
	9	9.410	2.762	-
5.0×10^{-5}M	5	8.120	5.201	-
+ Mutagen	7	10.977	2.344	+12.204
	9	9.872	2.240	-
6.0×10^{-5}M**	5	8.410	4.959	-
+ Mutagen	7	11.407**	1.925	+16.600
	9	10.315	1.816	-
7.0×10^{-5}M	5	7.902	5.423	-
+ Mutagen	7	10.752	2.573	+9.904
	9	9.645	2.469	-
8.0×10^{-5}M	5	7.685	5.341	-
+ Mutagen	7	10.429	2.585	+6.603
	9	9.325	2.479	-
9.0×10^{-5}M	5	7.467	5.558	-
+ Mutagen	7	10.106	2.908	+3.301
	9	9.112	2.812	-
10.0×10^{-5}M	5	7.322	5.936	-
+ Mutagen	7	9.892	3.366	+1.114
	9	8.783	3.260	-

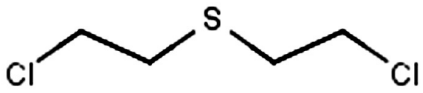
* Each value represents mean of three observations. (+) values indicate % increase in the yield of lactic acid.** Optimum concentraion of mutagens and yield of lactic acid. Experimental deviation ($\pm$) 1.5 to 2.5%

The pH of the medium was adjusted to 5.8 by adding requisite amount of 'phosphate-buffer' solution, and the pH was also ascertained by a pH meter. Now, M/1000 solution of Bis (2-chloroethyl) sulphidewas was made 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 flat bottom fermentor flask of 1st to 10th sets respectively.

Assay Methods : Lactic acid[15] formed and molasses[16] left unfermented was estimated colorimetrically. M / 1000 solution of Bis (2-chloroethyl) sulphidewas of mutagen has been used.

Results and Discussion

Facile bioproduction of 2-hydroxypropanoic acid by *Lactobacillus acidophilus* -2930 exposed to Bis (2-chloroethyl) sulphide



Bis (2-chloroethyl) sulphide

The results recorded in the table-1 shows that the Bis (2-chloroethyl) sulphide is much significant for facile bioproduction of 2-hydroxypropanoic acid by *Lactobacillus acidophilus* -2930. Bis (2-chloroethyl) sulphide causes significant enhancement in the bioproduction of lactic acid. It was found to be increasing upto its concentrations from 1.0×10^{-5} M to 6.0×10^{-5}M and above this concentration the facile bioproduction of 2-hydroxypropanoic acid by *Lactobacillus acidophilus* -2930 was found to be decreasing. However, bioproduction of lactic acid at all the experimental concentrations of the mutagen used were higher than that of control sets of flat bottom fermentor flasks.

The maximum production of lactic acid was found at 6.0×10^{-5}M concentration of the muagen Bis (2-chloroethyl) sulphide, i.e., 11.407 g/100 ml in 7 days of optimum incubation period which was found to be 16.600% higher in comparison to the control flasks, i. e., 9.783 g/100 ml in the same experimental condition except for the fact it contained no mutagen.

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