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Facile bioproduction of 2-hydroxypropanoic acid by *Lactobacillus acidophilus* -2930 exposed to 2-naphthyl hydroxyl amine

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Abstract : Mutagenic action of 2-naphthyl hydroxyl amine was studied on facile bioproduction of 2-hydroxypropanoic acid by *Lactobacillus acidophilus* -2930. It was found that 2-naphthyl hydroxyl amine enhances the yield of 2-hydroxypropanoic acid significantly to an extent of 12.257% higher in comparison to control.

(Keywords: Mutagens, 2-naphthyl hydroxyl amine , 2-hydroxypropanoic acid, *L. acidophilus* -2930).

Introduction

Germinal mutation, alteration in the genetic constitution of the reproductive cells, occurring in the cell divisions that result in sperm and eggs. Germinal mutations can be caused by radiation or chemical mutagens and may affect a single gene or an entire chromosome. A germinal mutation affects the progeny of the individual in whose reproductive cells the mutation arose and subsequent generations of that progeny. Unlike somatic mutations, which occur in the body cells and are not passed on to later generations, germinal mutations are important sources of genetic variation in natural populations that lead to evolutionary change through natural selection.

Molecular biology has helped us to understand the basic mechanisms underlying mutagenesis[1-8]. The discovery of chemical mutagens initiated a flurry of activities in the field of mutagenesis. Therefore, one of the very interesting and exciting fields of biochemical research to-day is that of mutagenic effect on different fermentation processes[9-16]. The survey of the literature reveals that much work has been done related to mutagenesis of plant breeding but not to feremention technology. The present communication deals with the effect of chemical mutagen 1,3-butane diol on facile bioproduction of 2-hydroxypropanoic acid 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

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 2-naphthyl hydroxyl amine 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[17] formed and molasses[18] left was estimated unfermented colorimetrically M / 1000 solution of 2-naphthyl hydroxyl amine of mutagen has been used.

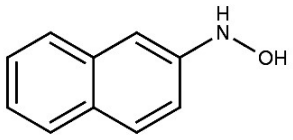
Table - 1
Facile bioproduction of 2-hydroxypropanoic acid by *Lactobacillus acidophilus* -2930

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	7.220	6.071	-
– Mutagen	7	9.651	3.586	-
	9	8.350	3.479	-
1.0×10^{-5}M	5	7.292	6.011	-
+ Mutagen	7	9.756	3.439	+1.087
	9	8.645	3.330	-
2.0×10^{-5}M	5	7.508	5.620	-
+ Mutagen	7	10.062	3.319	+4.258
	9	9.052	3.210	-
3.0×10^{-5}M	5	7.725	5.785	-
+ Mutagen	7	10.349	3.126	+7.232
	9	9.250	3.020	-
4.0×10^{-5}M**	5	8.086	5.613	-
+ Mutagen	7	10.834**	2.866	+12.257
	9	9.733	2.762	-
5.0×10^{-5}M	5	7.942	5.201	-
+ Mutagen	7	10.618	2.344	+10.019
	9	9.510	2.240	-
6.0×10^{-5}M	5	7.979	5.268	-
+ Mutagen	7	10.479	2.620	+8.579
	9	9.365	2.518	-
7.0×10^{-5}M	5	7.581	5.788	-
+ Mutagen	7	10.184	2.902	+5.522
	9	9.074	2.810	-
8.0×10^{-5}M	5	7.436	5.579	-
+ Mutagen	7	9.976	3.039	+3.367
	9	8.871	3.020	-
9.0×10^{-5}M	5	7.364	5.651	-
+ Mutagen	7	9.868	3.146	+2.248
	9	8.759	3.042	-
10.0×10^{-5}M	5	7.292	5.722	-
+ Mutagen	7	9.772	3.253	+1.253
	9	8.669	3.150	-

* 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%

Results and Discussion

Facile bioproduction of 2-hydroxypropanoic acid by *Lactobacillus acidophilus* -2930 exposed to N-(2-naphthyl)hydroxylamine



N-(2-naphthyl)hydroxylamine

The results of influence of N-(2-naphthyl)hydroxylamine on facile bioproduction of 2-hydroxypropanoic acid by *Lactobacillus acidophilus* -2930 has been recorded in the table 1. It is obvious from the results that the presence of the above chemical mutagen is also significant for lactic acid fermentation bioprocess. It was noticed that it was found to be increasing upto its concentation from 1.0 x 10^{-5}M to 4.0 x 10^{-5}M significantly and above this concentration it was found to be decreasing. however, bioproduciton of lactic acid at all the experiemental concentations used between 1.0 x 10^{-5}M to 10.0 x 10^{-5}M was found to be higher than the flat bottom control fermentor flasks.

The maximum lactic acid bioproduction was observed at 4.0 x 10^{-5}M concentration (optimum concentration) of N-(2-naphthyl) hydroxylamine (mutagen) i. e. 10.834 g/100 ml being 12.257% higher in comparison to the flat bottom control fermentor flasks, i. e.,9.651 g/100 ml in 7 days of optimum incubation period.

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