

Production of lactic acid by *Lactobacillus casei* NCIM-2617 exposed to 6-(3-methyl-2-butenyl)aminopurine

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Abstract: The efficacy of 6-(3-methyl-2-butenyl)aminopurine on production of lactic acid by *Lactobacillus casei* NCIM-2617 has been assessed. It has been found that the cytokine, i.e., 6-(3-methyl-2-butenyl)aminopurine at concentrations 8.0×10^{-5} M enhances the production of lactic acid to an extent of 10.886% higher in comparison to control while at 9.0×10^{-5} M and onwards concentrations of 6-(3-methyl-2-butenyl)aminopurine inhibits the production of lactic acid to a great extent in comparison to control.

(Keywords: Lactic acid fermentation, 6-(3-methyl-2-butenyl)aminopurine and *Lactobacillus casei* NCIM-2617).

Introduction

There are both pro-inflammatory cytokines and anti-inflammatory cytokines. There is significant evidence showing that certain cytokines/chemokines are involved in not only the initiation but also the persistence of pathologic pain by directly activating nociceptive sensory neurons.

Cytokines are produced by a broad range of cells, including immune cells like macrophages, B lymphocytes, T lymphocytes and mast cells, as well as endothelial cells, fibroblasts, and various stromal cells; a given cytokine may be produced by more than one type of cell.^{1,2,3}

In 1969 Dudley Dumonde proposed the term "lymphokine" to describe proteins secreted

from lymphocytes and later, proteins derived from macrophages and monocytes in culture were called "monokines". As scientists learned more, it was understood that these proteins and others were part of a broader class of proteins involved in self-defense, and should be called "cytokines".⁴⁻¹⁰

The influence of 6-(3-methyl-2-butenyl)aminopurine in fermentation technology specially lactic acid fermentation has not been studied extensively¹¹⁻¹³ 6-(3-methyl-2-butenyl)aminopurine is one of the few cytokine which has found effective chemical in fermentations.¹⁴⁻¹⁶

The present study was undertaken to production of lactic acid by *Lactobacillus casei* NCIM-2617 exposed to 6-(3-methyl-2-butenyl)aminopurine.

Experimental

Compositions of the production medium :

The composition of the production medium for production of lactic acid by *Lactobacillus casei* NCIM-2617 exposed to 6-(3-methyl-2-butenyl)aminopurine is as follows :
Molasses : 15% (w/v), Malt Extract : 0.75%
Yeast Extract : 0.75%, Peptone : 0.75%
(NH₄)₂HPO₄ : 0.75%, CaCO₃ : 5.0%, pH : 6.0
Distilled water To make up 100 ml.

(Adjusted by adding requisite amount of phosphate-buffer solution). Distilled water : To make up 100 ml.

Table - 4
Production of lactic acid by *Lactobacillus casei* NCIM-2617
exposed to 6-(3-Methyl-2-butenyl)aminopurine

Concentration of Cytokinin used $a \times 10^{-x}$ M	Incubation period in days	Yield of lactic acid in g/100 ml in the presence of cytokinins	Molasses substrate* left unfermented in g/100 ml	% of lactic acid increase in 6 days of incubation pd.
Control	3	3.710	2.299	—
(– Cytokinin)	6	6.568	0.636	—
	9	5.113	0.528	—
1.0×10^{-5} M	3	3.747	2.454	—
(+ Cytokinin)	6	6.635	0.568	(+) 1.020
	9	5.534	0.480	—
2.0×10^{-5} M	3	3.795	2.413	—
(+ Cytokinin)	6	6.723	0.484	(+) 2.359
	9	5.625	0.373	—
3.0×10^{-5} M	3	3.832	2.371	—
(+ Cytokinin)	6	6.788	0.415	(+) 3.349
	9	5.681	0.311	—
4.0×10^{-5} M	3	3.899	2.311	—
(+ Cytokinin)	6	6.910	0.295	(+) 5.207
	9	5.815	0.281	—
5.0×10^{-5} M	3	3.925	2.278	—
(+ Cytokinin)	6	6.956	0.267	(+) 5.907
	9	5.859	0.205	—
6.0×10^{-5} M	3	3.936	2.271	—
(+ Cytokinin)	6	6.978	0.230	(+) 6.242
	9	5.873	0.211	—
7.0×10^{-5} M	3	4.032	2.173	—
(+ Cytokinin)	6	7.150	0.198	(+) 8.861
	9	6.135	0.180	—
8.0×10^{-5} M**	3	4.106	2.198	—
(+ Cytokinin)	6	7.283***	0.119	(+) 10.886
	9	6.182	0.101	—
9.0×10^{-5} M	3	3.862	2.540	—
(+ Cytokinin)	6	6.847	0.555	(+) 4.247
	9	5.742	0.485	—
10.0×10^{-5} M	3	3.750	2.650	—
(+ Cytokinin)	6	6.650	0.659	(+) 1.248
	9	5.541	0.590	—

* Each value represents mean of three trials. ** Optimum concentration of cytokinin

*** Optimum yield of lactic acid (+) Values indicate % increase in the yield of lactic acid

Experimental deviation $\pm 2.5 - 3.5\%$

Assay methods :

Evaluation of lactic acid¹⁷ formed and molasses¹⁸ left unfermented was made colorimetrically.

Sterilization : The growth and production medium was sterilized in an autoclave maintained at 15 lbs steam pressure for 30 minutes.

Strain : *Lactobacillus casei* NCIM-2617 has been employed in the present study. The strain was procured from NCL - Pune, India

Age of the inoculum : 48 hours old.

Quantum of the inoculum: 0.5 ml bacterial suspension of *Lactobacillus casei* NCIM-2617

Incubation period : 3, 6 and 9 days

Concentration of 6-(3-methyl-2-butenyl)aminopurine used :

M/1000 solution of 6-(3-methyl-2-butenyl)aminopurine under trial has been prepared and 1.0×10^{-5} M to 10×10^{-5} M molar concentration of 6-(3-methyl-2-butenyl)aminopurine has been employed.

Results and Discussion

The results of the influence of 6-(3-Methyl-2-butenyl)aminopurine on production of lactic acid by *Lactobacillus casei* NCIM-2617 has been recorded in the table-1. It is obvious from the results that in the presence of above cytokinins, i.e. 6-(3-methyl-2-butenyl)aminopurine the production of lactic acid by *Lactobacillus*

casei NCIM-2617 has been enhanced at its all molar concentration but to a lesser amount.

It has been noticed that the presence of above cytokinins compound, i.e., 6-(3-Methyl-2-butenyl)aminopurine was found to be less beneficial and encouraging for the improved yield of lactic acid up to its concentration from 1.0×10^{-5} M to 8×10^{-5} M but not so significant and above this concentration the cytokinin under trial has retarded the production of lactic acid by *Lactobacillus casei* NCIM-2617. However, it is interesting to note that production of lactic acid by *Lactobacillus casei* NCIM-2617 exposed to all the experimental concentrations, i.e., from 1.0×10^{-5} M to 10.0×10^{-5} M of cytokinins under trial has been found to be slight better than the control fermentor flasks. However, at 9.0×10^{-5} M to 10×10^{-5} M concentrations of cytokinin under trial the production of lactic acid by *Lactobacillus casei* NCIM-2617 has been found in decreasing order.

The maximum production of lactic acid by *Lactobacillus casei* NCIM-2617 was observed at 8.0×10^{-5} M concentration of 6-(3-methyl-2-butenyl)aminopurine for production of lactic acid by *Lactobacillus casei* NCIM-2617, i.e., 7.283g/100ml which is 10.886% higher in comparison to control fermentor flasks, i.e., 6.568g/100 ml in 6 days of optimum incubation period.

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