

## NOTE

## Studies on Submerged Lactic Acid Fermentation Exposed to Tropine and Quinidine Alkaloids

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The influence of tropine and quinidine alkaloids was studied on submerged lactic acid fermentation by *Lactobacillus bulgaricus* BS-18. It has been found that both the alkaloids used slightly enhance bioconversion of sucrose to lactic acid when present in their optimum concentrations.

The influence of alkaloids on microorganisms and fermentation processes has not been studied very extensively<sup>1</sup>, due to the toxic nature of the alkaloids. But alkaloids as a class have attracted organic chemists partly on account of their physiological action on the microorganisms, and partly on account of the complex structural and synthetical puzzles that they pose. Somogli<sup>2</sup> reported that quinine and atropine in traces accelerated the growth of the yeasts. Kligler<sup>3</sup> reported the inhibitory action of caffeine on several microbes. Caffeine has also been reported as a most effective chemical in various biological processes<sup>4-6</sup>. Since some alkaloids are known to be produced during some fermentation process, it is obvious that such alkaloids are not toxic to the organisms involved in the fermentation processes<sup>7-10</sup>. In the recent past Singh *et al.*<sup>11-13</sup> also studied the influence of different groups of alkaloids on microbial synthesis of lactic acid fermentations and observed that most of the alkaloids were beneficial for the fermentative processes when incorporated in lower concentrations.

In the present communication we have confined our study to the bioconversion of sugar to lactic acid by submerged fermentation exposed to some alkaloids by *L. bulgaricus* BS-18 in 5 days of incubation period at 48°C and at pH 6.2.

**Medium:** The composition of the production medium for each fermentor flask containing 100 mL production medium is as below:

Sucrose: 10.5%, malt-extract: 0.375%; (NH<sub>4</sub>)<sub>2</sub>HPO<sub>4</sub>: 0.25%; CaCO<sub>3</sub>: 10.185%; distilled water: to make 100 mL; pH: 6.2 (adjusted by adding requisite amount of phosphate buffer solution); Temperature: 48°C.

**Sterilization:** The growth and production media were sterilized in an autoclave maintained at 15 lbs steam pressure for 30 min.

**Strain:** *Lactobacillus bulgaricus* BS-18 was used in the present study. The strain was procured from National Chemical Laboratory, Pune, India.

**Assay methods:** Evaluation of lactic acid formed and sucrose left unfermented was made colorimetrically<sup>14, 15</sup>.

Incubation period: 4, 5 and 6 days; optimum incubation period: 5 days; age of the inoculum: 48 h old; quantum of the inoculum: 0.5 mL bacterial suspension of *L. bulgaricus* BS-18.

**Concentration of alkaloids used:**  $1.0 \times 10^{-5}$  M to  $5.0 \times 10^{-5}$  M molar concentration of corresponding alkaloids has been employed.

The presence of tropine (Table-1) does not have marked influence on bioconversion of sucrose to lactic acid. The maximum production of lactic acid was found to be 7.383 g/100 mL (76.50% on the basis of fermentable sucrose) at  $3.0 \times 10^{-5}$  M concentration of tropine which was just 0.95% more in comparison to control flasks.

The presence of quinidine (Table-1) has slight stimulating effect on bioconversion of sucrose to lactic acid at all the concentrations. The maximum production of lactic acid was found to be 7.459 g/100 mL at  $3.0 \times 10^{-5}$  M concentration of quinidine (*i.e.*, 76.81% on the basis of fermentable sucrose) which was more than that of control flasks, *i.e.*, 6.966 g/100 mL (75.58% on the basis of fermentable sucrose) in 5 days of optimum incubation period.

TABLE-1  
THE INFLUENCE OF SOME ALKALOIDS ON LACTIC ACID FERMENTATION BY  
*L. BULGARICUS* BS-18

Concentration of alkaloids M/1000	Incubation period in days	Yield of lactic acid*		Sugars* left unfermented in g/100 mL	% of lactic acid increase in 5 days
		In g/100 mL	% Conversion		
<b>Tropine</b>					
Control	5	6.968	75.558	1.278	—
$1.0 \times 10^{-5}$ M	5	6.991	75.627	1.256	(+) 0.33008
$2.0 \times 10^{-5}$ M	5	7.218	76.203	1.028	(+) 3.58783
$3.0 \times 10^{-5}$ M	5	7.343	76.505	0.902	(+) 5.38174
$4.0 \times 10^{-5}$ M	5	7.196	76.148	1.050	(+) 3.27210
$5.0 \times 10^{-5}$ M	5	6.985	75.595	1.260	(+) 0.24397
<b>Quinidine</b>					
Control	5	6.966	75.585	1.284	—
$1.0 \times 10^{-5}$ M	5	7.112	75.966	1.138	(+) 2.09589
$2.0 \times 10^{-5}$ M	5	7.213	73.231	1.038	(+) 3.54579
$3.0 \times 10^{-5}$ M	5	7.459	76.817	0.790	(+) 7.07723
$4.0 \times 10^{-5}$ M	5	7.351	76.556	0.898	(+) 5.52684
$5.0 \times 10^{-5}$ M	5	7.017	75.712	1.232	(+) 0.73212

\*Each value represents mean of three trials.

(+) Values indicate % increase in the yield of lactic acid. Experimental deviation  $\pm 2.5 - 3.0\%$ .

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