

Role of Amino Acids on the Growth and Lipase Production of *Streptococcus faecalis*

Lactic acid bacteria have been reported to elaborate lipases¹⁻⁴. Incorporation of amino acids in the basal medium has been found to enhance lipase production⁵⁻⁷. The present study was conducted to investigate the effect of amino acids incorporation on the growth of *Streptococcus faecalis* and synthesis of lipase.

Materials and methods. A strain of *S. faecalis* (272) was isolated from stored Khoa samples. The culture was propagated in a basal medium consisting of 2% peptone (Oxoid), 0.3% yeast extract (Oxoid), 1% glucose (B.D.H), 0.5% NaCl (B.D.H), 10% tomato juice, with pH adjusted to 7.5.

Lipase activity was determined by the method of Oi et al.⁸ with some modifications with regard to substrate and buffer. The reaction mixture contained 5.0 ml butter oil emulsion, 5.0 ml of 0.2 M Tris-HCl buffer (pH 7.5), 2 ml of 0.2 M NaCl solution, 2 ml of glass distilled water and 1 ml of enzyme solution. In the control set, the enzyme was boiled for 20 min. The pH of the reaction mixture in the control set was first noted and then the pH of the experimental set was brought to the same level by the addition of 0.01 N alkali. The amount of 0.01 N alkali required to bring the pH of the enzyme solution to that of control corresponded to the lipase activity in terms of μ moles of free fatty acids.

The requirement of essential amino acids for growth and lipase production by *S. faecalis* was determined by deleting each of the amino acids from the complete

synthetic medium⁸. *S. faecalis* was inoculated into 19 sets of media and incubated at 30°C for 24 h. The extracellular enzyme obtained, was then adjusted to pH 7.5 at 4°C by the addition of 0.01 N alkali. Lipase activity was then estimated in each case⁹.

Results and discussion. The omission of amino acids like arginine, glutamic acid, histidine, isoleucine, leucine, methionine, threonine, tryptophane and valine from the synthetic medium resulted in a marked decline in growth (0.40 to 0.43, O.D.) as well as lipase production (0.2 to 0.7 μ moles) (Table). Amino acids such as alanine, glycine, lysine and serine appeared to stimulate lipase production, whereas aspartic acid, cystine, phenylalanine, proline and tyrosine were non-essential for both growth and lipase production. In contrast, SNELL and GUIRARD¹⁰ reported that methionine, valine, histidine and isoleucine were not essential for the growth of *S. faecalis*. Our results as to the essential nature of 9 amino acids are comparable with those of GREENHUT et al.¹¹, where 4 essential amino acids were not found to be essential for the growth of *Streptococcus faecalis* (272).

Summary. A study was conducted on the requirement of amino acids for the growth of *S. faecalis* and its lipase production. Arginine, glutamic acid, histidine, leucine, isoleucine, methionine, threonine, tryptophane and valine were found to be essential, with alanine, glycine, lysine and serine as stimulatory and aspartic acid, cystine, phenylalanine, proline and tyrosine as non-essential for both growth and lipase synthesis.

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Amino acids requirement of *S. faecalis* in relation to growth and lipase production

Amino acids omitted	O.D. (660 nm)	Lipase activity ^a
None	0.70	4.6
Alanine	0.60	3.0
Aspartic acid	0.71	4.5
Arginine	0.42	0.20
Cystine	0.70	4.2
Glutamic acid	0.43	0.30
Glycine	0.64	3.7
Histidine	0.42	0.4
Isoleucine	0.43	0.7
Leucine	0.41	0.7
Lysine	0.64	3.5
Methionine	0.43	0.75
Phenylalanine	0.69	4.60
Proline	0.69	4.7
Serine	0.60	2.5
Threonine	0.43	0.5
Tyrosine	0.70	4.5
Tryptophane	0.42	0.30
Valine	0.40	0.25

^a μ moles of free fatty acids released/ml of broth.

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Studies on the Effect of Allicin (Diallyl Disulphide-Oxide) on Alloxan Diabetes

The author has reported in a previous paper¹ on the beneficial effects of allicin ($\text{C}_3\text{H}_5\text{-S}-\overset{\text{O}}{\underset{\uparrow}{\text{S}}}\text{-C}_3\text{H}_5$) on alloxan diabetes with special reference to its hypoglycemic action. Such an effect was found only in diabetic animals which responded to tolbutamide, viz. mild alloxan diabetes. The effects of both these drugs were found to be dependent on

the insulin reserves of the animals. In the present study the author has investigated the dose-effect relation of allicin and also its effect on short-term treatment, as compared to the standard drug tolbutamide on the fasting

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