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SELECTION OF SUITABLE MICROORGANISM FOR THE PRODUCTION OF L-GLUTAMIC ACID.

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ABSTRACT

An experimental study was carried out to select suitable microorganism for l-glutamic acid fermentation for this purpose, different regulatory mutant strains namely *Micrococcus glutamicus* AB_1, *Psendomonas replivora* AB_1, *Bacillus Cirenlans* AB_1, *Saccharomyces cerevisae* AB_1 and *Aspergillus niger* AB_1 were subject to fermentation to examine their potency to accumulate l-glutamic acid in the fermentation broth. *Saccharomyces cerevisae* did not accumulate l-glutamic acid in the fermentation broth. Among the other microorganism studies, *Micrococcus glutamicus* AB_1 accumulated maximum l-glutamic acid (0.7 mg/ml) in the fermentation broth and thus, selected for the further studies.

KEY WORDS

Microorganism, Fermentation, l-glutamic acid, *Micrococcus glutamicus*]

INTRODUCTION

Interest in l-glutamic acid, the first amino acid to be produced by fermentation on a large scale, was stimulated by the increasing demand for monosodium l-glutamate as a flavor enhancing agent[1]. We owe much of our knowledge of microbial production of l-glutamic acid and other amono acid as well, to Japanese research[2]. Most of the literature of l-glutamic acid production is in Japanese; fortunately some has also appeared in English at least in abstract form[3]. A great variety of microorganisms has been isolated or induced for l-glutamic acid production [4,5].

Our present investigation was intended to examine the potency of different mutant microorganisms namely *Micrococcus glutamicus* AB_1, *Psendomonas replivora* AB_1, *Bacillus Cirenlans* AB_1, *Saccharomyces cerevisae* AB_1 and *Aspergillus niger* AB_1 for the production of l-glutamic acid.

MATERIAL AND METHOD

Microorganisms employed : Different regulatory mutants *Micrococcus glutamicus* AB_1, *Psendomonas replivora* AB_1, *Bacillus Cirenlans* AB_1, *Saccharomyces cerevisae* AB_1 and *Aspergillus niger* AB_1.

Compositions of basal salt media :

(i) Basal salt medium for bacteria contained glucose, 10%; urea, 0.8%; K_2HPO_4, 0.1%; $MgSO_4.7H_2O$, 0.025%; Yeast extract, 0.02%; pH 7.0.

(ii) Basal salt medium for yeast contained : Glucose, 10%; urea, 2%; K_2HPO_4, 0.1%; $MgSO_4.7H_2O$, 0.025%; Yeast extract, 0.02%; NaCl, 0.02%; $CaCl_2.2H_2O$, 0.02%; $FeSO_4.7H_2O$, 0.03%; $ZnSO_4.7H_2O$, 0.002%; pH was adjusted to 5.0.

(iii) Basal salt medium for Aspergillus niger contained glucose, 10%; urea, 2%; K_2HPO_4, 0.06%; KH_2PO_4, 0.04%; $MgSO_4.7H_2O$, 0.04%; NaCl, 0.02%; $CaCl_2.2H_2O$, 0.02%; $FeSO_4.7H_2O$, 0.03%; $ZnSO_4.7H_2O$, 0.002%, pH was adjusted to 5.0.

Analysis of Amino acid : Descending paper chromatography was employed for detecting L-glutamic acid in culture medium and was run for 18h on a watman No. 1 chromatographic paper. Solvent system used include, n-butanol : acetic acid : water (2 : 1 : 1). The spots were visualized by spraying with a solution of 0.2% ninhydrin in acetone by spraying with a solution of 0.2% ninhydrin in acetone and quantitative estimation of L-glutamic acid in the suspension was done using colorimetric estimation method[6,7].

RESULT AND DISCUSSION

Table 1

Accumulation of L-glutamic acid by different regulatory microorganisms.

	Microorganism(s)	L-glutamic acid (mg/ml)
1	*Micrococcus glutamicus* AB_1	0.7 ± 0.03 mg/ml
2	*Pseudomonas replivora* AB_1	0.1 ± 0.02 mg/ml
3	*Bacillus circulans* AB_1	0.2 ± 0.01 mg/ml
4	*Saccharomyces cerevisiac* AB_1	-
5	*Aspergillus niger* AB_1	0.05 ± 0.01 mg/ml

Values were expressed as mean ± SEM; where n=6.

From table 1, it s clear that among different microorganisms studied, Micrococcus glutamicus AB_1 (Fig. 1) was proved to be most suitable organism for l-glutamic acid production.

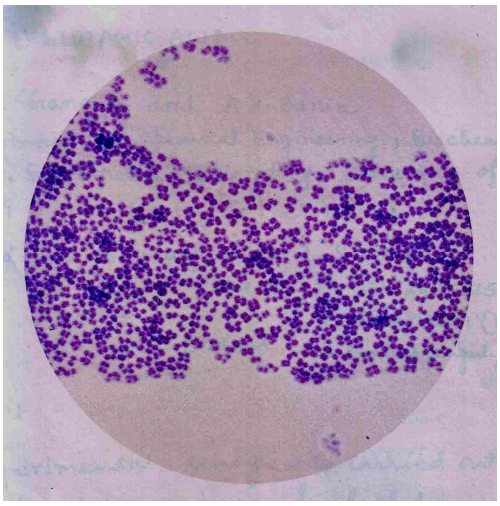

Fig. 1
Photomicrographic representation of the selected high l-glutamic acid yielding regulatory strain Micrococcus glutamicus AB_1.

Most of the reviews available on the production of l-glutamic acid also claimed that *Micrococcus glutamicus* was most suitable among different microorganisms for l-glutamic acid production [4,9-12]. Now, in our further investigation, we will try to improve the production of l-glutamic acid by developing high l-glutamic acid yielding strain of *Micrococcus glutamicus* by induced mutation.

REFERENCE

1. Yugandhar N M., Kiran Banu U., Raju Ch Al., Raju J and Reddy DSR., Optimization of Glutamic acid production by *Brevibacterium roseum.* Res. J. Microbiol. 1(5) : 428-432 (2006.
2. Nakayama K., Kitada S. and Kinoshita S., studies on lysine fermentation I. The control mechanism on lysine a accumulation by homoserine and threonine. J Gen Appl Microbiol. 7 : 145-154 (1961).
3. Shiio I., Otsuka S., Takahashi M., Effect of biotin on the bacterial formation of glutamic acid. I. Glutamate formation and cellular permeability of amino acids. J Biochem. 51 : 56-62 (1962).
4. Udaka S., Screening method for microorganisms accumulating metabolites and its use in the isolation of *Micrococcus glutamicus*. J. Bacteriol, 79 : 754-755 (1960).
5. Cartio S L. and Pisano M A. Production of Alanine by *Fusarium moniliforme.* Appl. Microbiol, 14(1) : 39-44 (1966).
6. Chinard F P., Photomeric estimation of proline and ornithine. J. Biol. Chem, 199 : 91-95 (1952).
7. Spies J R., Colorimetric procedures for amino acid. Methods in Enzymol, 3 : 468-471 (1957).
8. Kimura E., Yagoshi C., Kawahara Y., Ohsumi T., Nakamatsu T and Tokuda H., Glutamate over production in *Corynebacterium glutamicum* triggered by a decrease in the level of a complex comprising DtsR and a biotin – containing subunit., Bio Sci Biotechnol Bio Chem. 63 : 1274-1278 (1999).

9. Hirasawa T., Wachi M., Nagai K., A mutation in the *Corynebacterium glutamicum* It's A gene causes subceptibility to lysozyme, temperature – sensitive growth, and L-glutamate production. J Bacteriol, 182 : 2696-2701 (2000).
10. Gutmann M, Hoischen C, Kiamer R., Carrier-mediated glutamate secretion by *Corynebacterium glutamicum* under biotin limitation., Biochim Biophys Acta, 112 : 115 – 123 (1992).
11. Hoischen C and Kramer R., Membrane alteration is necessary but not sufficient for effective glutamate secretion in *Corynebacterium glutamicum*., J Bacteriol, 172 : 3409-3416 (1991).