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SAUSSUREA LAPPA (KUTH) AS A NEW SOURCE OF INULIN FOR FERMENTATIVE PRODUCTION OF INULINASE IN A LABORATORY STIRRED FERMENTER

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Abstract

Inulinase was produced by Aspergillus niger *van Teighem UV11 in a 10 l glass fermenter using readily-available nitrogenous by-products, corn steep liquor (CSL), defatted groundnut meal and defatted soya-bean meal, in different concentrations with kuth (*Saussurea lappa*) root powder as a source of inulin (as inducer), under varying agitation conditions. With the combination of kuth (1·0%), aeration (1·5 vvm) and agitation (300 rpm), the maximum yield of insulinase obtained was 290 Uml^{-1} after 72 h.*

Key words: Aspergillus niger, fermenter, inulinase, *Saussurea lappa.*

INTRODUCTION

Inulin is a polymer of plant origin that serves as a reserve carbohydrate in Compositae and Graminae. Jerusalem artichoke and chicory plant roots containing inulin have been used for fermentative production of inulinase by microorganisms (Manzoni & Cavazzoni, 1992; Gupta *et al.*, 1988). *Saussurea lappa* (kuth or costus — common name) belongs to the Compositae family and contains inulin in the roots. Kuth root as a rich source of inulin has been utilized for high-fructose-syrup production by chemical hydrolysis (Kulkarni *et al.*, 1969). Kuth root powder as a source of inulin for inulinase fermentation has not been reported. In the present studies, kuth root powder was used as the source of inulin for inulinase production in a 10 l fermenter.

METHODS

Carbon and nitrogen analyses

Total carbon and nitrogen contents of the kuth root powder [local market, Bombay, India and powdered in a flour mill to a very fine powder (60 mesh)] and corn steep liquor (CSL; Anil Starch Ltd, Ahmedabad) were determined by Total Carbon Analyzer (Beckmann, USA) and Kjeldhal methods respectively.

Inulin content

Inulin content of kuth root powder was determined using Streptakov phosphomolybdic-permanganate (Winton & Winton, 1960).

Preparation of inoculum

Aspergillus niger van Teighem UV11, the UV mutant of a soil isolate (Poorna & Kulkarni, 1994), was subcultured on the synthetic medium agar of Allais *et al.* (1987) and incubated at 30±2°C for 72 h. The spores were then harvested and suspended in 0·85% saline containing 0·01% Tween 80 to obtain $2{\cdot}5 \times 10^6$ spores per ml (by haemocytometer count). A 5% (v/v) inoculum of this suspension was used.

Medium

The medium (B) used for fermentation had the following composition (per litre): kuth root powder, 10 g; CSL, 10 g; KH_2PO_4, 5 g; trace elements solution, 1 ml; silicone oil, 0·001%; and pH 5·4. A total volume of 6 l was used for every batch of fermentation studies. The medium was sterilized by autoclaving at 121·6°C for 15 min. Aeration was maintained at 1·5 vvm and agitation at 225 rpm unless otherwise stated; 20 ml samples were withdrawn at specific intervals to assay for inulinase activity.

The composition of the medium and volume of inoculum used was the same for all parameters studied unless otherwise stated. Effect of different process parameters was studied as follows. Fermentations were carried out in duplicate and average results are given.

Time course analysis of inulinase fermentation

About 20 ml samples were siphoned out of the 10 l glass fermenter (Enmvee Co. Ltd, Pune) every 24 h and assayed for inulinase activity, reducing sugar content of the medium and pH.

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