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FACTORS AFFECTING THE PRODUCTION OF CELLULASE BY *CHAETOMIUM CLOBOSUM*

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The effect of different concentrations of CMC on the production of cellulase by *Chaetomium globosum* was studied. Maximum yield of cellulase of 6.0 units when 2.5 per cent glucose alongwith 0.3 per cent CMC as the carbon source were used in the medium at pH. of 5.0.

INTRODUCTION

Pakistan, being an agricultural country, has abundant quantities of waste cellulosic material like bagasse, saw dust, rice bran and paper waste which have no commercial use. Only small quantities of rice bran have been utilized as feed ingredient. The caloric requirements of both humans and domestic animals are obtained from grains. Hence there exists a great competition in the consumption of cereals between domestic animals and human beings. In order to decrease this competition, a non-conventional source of energy has been explored. The biodegradation of cellulose can be carried out by microorganisms which produce cellulolytic enzymes as reported by Mandels and Reese (1957).

Cellulase is an adaptive enzyme which can be improved quantitatively by the use of proper substances in the substrate. For this purpose the fungus was grown on different liquid media having variations in the cellulose source.

MATERIALS AND METHODS

Culture of *Chaetomium globosum* was maintained on potato-agar-dextrose medium and incubated at 30 C for 96 hours. A uniform suspension of the spores was prepared by adding 20 ml of 0.005 Monoxal O.T. (Diacetyl ester of sodium sulphosuccinate) and it was used as inoculum. Six aqueous

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liquid media (A0, A1, A2, A3, A4, A5) were prepared with variable concentrations of carboxy methyl cullulose (CMC). The chemical composition of these media is given in Table 1. pH of each medium was adjusted to 5 with citric acid.

Table 1 *Composition of various media*

Chemicals		Medium (Amounts/litre)					
		A0	A1	A2	A3	A4	A5
Glucose	(g)	25.0	25.0	25.0	25.0	25.0	25.0
Calcium Nitrate	(g)	0.5	0.5	0.5	0.5	0.5	0.5
Potassium Dihydrogen Phosphate	(g)	1.0	1.0	1.0	1.0	1.0	1.0
L-Asparagine	(g)	1.5	1.5	1.5	1.5	1.5	1.5
Magnesium Sulphate	(g)	0.5	0.5	0.5	0.5	0.5	0.5
Thiamine	(ug)	150.0	150.0	150.0	150.0	150.0	150.0
Carboxy methyl cellulose	(g)	0.0	1.0	2.0	3.0	4.0	5.0

Fifty ml of each liquid medium were taken in a conical flask separately These flasks were plugged with cotton and sterilized in an autoclave at 121°C for 15 minutes Each one of the flasks were then allowed to cool at room temperature and inoculated with 1 ml spore suspension and finally incubated at 30±2°C for 96 hours The fungal suspension was filtered through ordinary filter paper Cellulase was estimated in terms of glucose units according to the method of Menezes *et al* (1973) Glucose was determined by the dinitrosalicylic acid (DNS) method as given by Ghose (1969)

RESULTS AND DISCUSSION

Results obtained on the biosynthesis of cellulase by *Chaetomium globosum* in different media with varying levels of CMC are shown in Table 2

It was observed that the least production of cellulase (3.78 units per ml) by the fungus in medium A0 which did not contain CMC whereas maximum production of cellulase (6.00 units/ml) was observed in the medium A3 which contained 0.3 per cent CMC along with 2.5 per cent glucose The synthesis of cellulase in other media A1, A2, A4 and A5 were 4.86, 4.98, 4.08 and 3.90 units per ml, respectively This means that the presence of CMC upto 0.3

per cent promoted the synthesis of cellulase but the increase of CMC concentration beyond 0.3 per cent adversely affected the cellulase production The statistical analysis revealed that the yield of cellulase was influenced by the addition of CMC and it was significantly higher in medium A3 as compared to the rest of the media. These results are in accordance with those of Reese *et al* (1969), Rautella and King (1969) and Yamane *et al* (1970) who reported maximum cellulase production in the presence of cellulosic materials in the media by fungi.

Table 2. *Effect of changes in the concentration of CMC on the production of cellulase*

Medium	CMC (gms/litre)	Cellulase (units/ml)
A0	0.00	3.78
A1	1.00	4.86
A2	2.00	4.98
A3	3.00	6.00
A4	4.00	4.08
A5	5.00	3.90

LITERATURE CITED

Ghose, T.K., 1969. Continuous enzymatic saccharification of cellulose with culture filtrates of *Trichoderma viride*. Biotech. and Bioengg. 11: 239.

Mandels, M. and E.T. Reese, 1957. Induction of cellulase in *Trichoderma viride* as influenced by carbon source and metals. J. Bact 73: 269.

Menezes, H.C . T.J.B. Menezes and H.V. Boas, Jr., 1973 Fungi culture and culture medium for the production of cellulases. Biotech and Bioengg 15: 1123.

Rautella, G.S. and K.W. King, 1968. Significance of the crystal structure of cellulase in the production and action of cellulases Arch. of Biochem. Bioph., 123: 589.

Rease, E.T., J.E. Lola and W.F. Parrish, 1969. Modified substrates and modified products as inducers of carbohydrases. J Bact. 100: 1151.

Yamane, K., H. Suzuki, M. Hirotani, Nozawa and K. Nisizawa, 1970. Effect of nature and supply of carbon sources and cellulase formation in *Pseudomonas floureseens*. Ver. Cellulosa. J. Biochem. 67(1): 9—18.