

A PACKED BED SOLID-STATE CULTIVATION SYSTEM FOR THE PRODUCTION OF ANIMAL FEED: CULTIVATION, DRYING AND PRODUCT QUALITY

E. Gumbira-Sa'id*#, D.A. Mitchell\$, P.F. Greenfield\$ & H.W.Doeille+

- (#) Inter University Centre of Biotechnology, Bogor Agricultural University, P.O. Box 377, Bogor, Indonesia.
(\$) Departments of Chemical Engineering and Microbiology (+), The University of Queensland, Brisbane, QLD. 4072, Australia.

SUMMARY

A standing column packed bed bioreactor was constructed to enable packed bed operation during solid-state cultivation (SSC) of sago starch by *R. oligosporus* UQM 145F, to be followed by *in situ* drying of the microbial product. The essential amino acid composition of the microbial product was determined from the samples obtained from the cultivation with a substrate loading of 250 g.

INTRODUCTION

In comparison with submerged liquid cultivation, solid-state cultivation has the advantage that the high concentration of dry matter allows a reduction in the size of equipment to be used and reduces the cost of drying the final product. Although strong research efforts have been made to improve the SSC process, little attention has been given to the drying of the microbial product.

A standing column packed bed bioreactor was constructed as an improvement on Sartorius packed bed bioreactors (Gumbira-Sa'id *et al.*, 1991, 1992) to enable packed bed operation during SSC of sago starch at larger scale, and *in situ* drying of the microbial products. Artificial drying in the oven or sun-drying, followed by milling, are the main downstream processes applied to microbial protein enriched products (Trevelyan, 1974; Daubresse *et al.*, 1987). This study has attempted to introduce drying of the microbial products *in situ*, by passing hot dry air (in contrast to the humid air supplied during the culture) through the system at completion of the process. Drying the microbial product in the column has advantages, since the wet product does not have to be unloaded from the column, and the efficiency of the equipment can be increased. This should be advantageous at pilot plant scale, since unloading the wet microbial product is not always practical (Durand *et al.*, 1988).