

Effect of carbon sources on lipid accumulation and fatty acid composition by *Penicillium decumbens* ITCC 3627

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ABSTRACT

Soil being the rich source of microorganisms, soil fungi were screened using three different mineral media and on the basis of the lipid content in the screening experiment, one organism was chosen-for further study. This culture was obtained in pure form and was identified as *Penicillium decumbens* (ITCC 3627). The physicochemical condition of the fermentation medium influence the kind and quality of fatty acids produced by the moulds and therefore formulating a suitable medium is an essential step in the fermentation process. Amongst all the parameters, the carbon source is the most important factor that influences lipid yield. Hence, the influence of various carbon sources on the lipid producing capacity of *P. decumbens* was studied. Out of different carbon sources, glucose was found to be the most preferred carbon source for lipid production. The fatty acid profile of the mould was also studied in the medium containing glucose as a carbon source. The concentration of essential fatty acids was found to be comparable with the fatty acids profile of groundnut oil. This suggests that for the optimum lipid yield and essential fatty acid production, the optimization of some of the parameters is necessary so that production of single cell oils can be undertaken.

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Nature has the reservoir of microorganisms. A number of microorganisms from soil produce commercially important products though in low concentrations. Exploring the industrial commercial capabilities of such microbes therefore necessitates their isolation from the mixed natural micro flora (Dayal and Narine, 2005; Jansa *et al.*, 1999). Soil being the rich source of microorganisms, soil fungi were isolated and characterized on the basal mineral medium.

The physico-chemical conditions of the fermentation medium influence the kind and quality of fatty acids produced by the microorganisms (Kendrick and Ratledge, 1992). Many natural, semi synthetic and synthetic media are in use for the cultivation of fungi. Of these, five different media were selected and screened in the present study to see as to which medium supports maximum accumulation of lipids in the selected soil fungi. Having isolated and characterized the fungi, it was necessary to find out their native lipid producing capacity in basal mineral medium. This would help in the selection of most promising organism for fermentative production of single cell lipids. On the basis of the lipid content in the screening experiment, one organism was chosen, purified and was identified as *Penicillium decumbens*. Various physical and chemical conditions of the medium together constituting the culture environment profoundly affect the rate of accumulation of lipids by oleaginous

microorganisms (Jang *et al.*, 2005). Hence, having isolated the lipid producing strain from soil and screened for suitable growth medium, it is necessary to obtain maximum yield of single cell lipids. Amongst all the parameters, the carbon source has an important role to play in the fungal biomass production and lipid synthesis. Similarly, the nature of the carbon source has a pronounced effect on the quality and composition of microbial lipids (Sandra *et al.*, 2005).

Five different carbon sources glucose, fructose, maltose, lactose and sucrose were tested for lipid production. Glucose was found to be the most efficiently used substrate by the soil isolate giving a higher biomass and lipid yield (Kavadia *et al.*, 2001 and Seraphim *et al.*, 2003).

Many microorganisms have been shown to accumulate very high amounts of lipid intracellularly and produce lipids of composition closely similar to vegetable oils (Kavadia *et al.*, 2001 and Yu *et al.*, 2003).

The present work includes the optimization of lipid production and fatty acid composition of lipid synthesized by *Penicillium decumbens* grown in Evans mineral medium (Ahmed *et al.*, 2006) containing glucose and NH_4Cl as the carbon and nitrogen source, respectively. The fatty acid composition of *Penicillium decumbens* was compared with that of the groundnut oil.

MATERIALS AND METHODS

Screening and Isolation for Lipid producers: More