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Optimization of cultural conditions for the production of sophorolipids from *Candida Tropicalis*

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Abstract

The present study was aimed to optimise the cultural conditions for the production of sophorolipids from candida tropicalis. The cultural conditions such as pH, temperature, incubation period and speed of agitation were determined by using small scale bench top 5L fermenter (Murhopye scientic, LF). From our study the optimum pH for sophorolipid production was found to be at pH 3.5, optimum temperature was at 30^{o}C, optimum incubation period was 7days and the speed of agitation was found to be at 200 rpm when compared with several cultural conditions for the maximum yield of sophorolipids.

Key words: sophorolipids, candida tropicalis, optimisation, cultural conditions, production

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INTRODUCTION

1. Sophorolipids:

Sophorolipids are biosurfactants which consists of a dimeric carbohydrate sophorose linked to long-chain hydroxy carboxylic acids. They are usually a mixture of atleast six to nine different hydrophobic sophorolipids. Yeasts have been shown to be potent producers of sophorolipids type of biosurfactant. The sugar unit is the disaccharide sophorose which consists of two β - 1, 2 - linked glucose units. The 6 and 6' hydroxy groups are generally acetylated[1]. *Torulopsis bombicola* produces a sophorolipid like biosurfactant during alkane fermentation[2-4] while *Torulopsis petrophilum* and *Torulopsis apicola* are major producers of sophorolipids[5,6]. A surface active glycolipid from *Candida petrophilum* grown on hydrocarbons while *Candida bogoriensies* produces a glycolipid in which sophorose is linked to decosanoic acid diacetate[7].

2. Sophorolipid Production

The ideal condition for sophorolipids production in a small scale bench top fermenter (Murhopye scientific,LF)with medium containing glucose-100 g/L,yeast extract-10g/L,urea-10g/L and oleic acid-40 ml/L.

3. Environmental Factors

Other than nutrient limitations, many researchers shown the influence of environmental conditions like pH, cultivation temperature, rate of oxygen transfer and speed of agitation is increasing the yield of biosurfactant production.

4. Effect of pH

There is maximum rhamnolipid production at a pH of 6.2-6.4. The pH of the medium plays an important role in sophorolipid production by *Torulopsis bombicola*[8]. In *Bacillus cereus*, lowering the pH of the medium below 6.5 decreased the product, i.e. the biosurfactant yield.

5. Effect of Temperature

Serratia rubidaca shows surface activity only when grown at 30^0C but not at 37^0C temperature. The biosurfactants, rubiwettins R and RG were located in extracellular vesicles which are formed only when the cells are grown at 30^0C. Production of biosurfactant by *Arthrobacter paraffenius* and *pseudomonas sp*. DSM-2874 is found to be sensitive to changes in temperature. Interestingly, temperature has been found to alter the composition of biosurfactant produced. There is maximum rhamnolipid production at an optimal temperature of 32-34^0C

6. Speed of Agitation

Increase in the agitation speed results in the reduction of biosurfactant yield in *Nocardia erythropolis*[9-15].

RESULTS AND DISCUSSION

Optimisation of Cultural Conditons

A. Effect of pH:

The optimum pH for the fermentation process of *Candida tropicalis* was determined by carrying out the fermentation of SLs at various pH ranging from 2 to 5. was carried out in a 5 lt bench top fermentor.

Table 1: Effect of different pH on SLs production by *Candida tropicalis*

pH	2	2.5	3	3.5	4	4.5	5
Sls (g/L)	17.12	18.23	19.83	30.43	17.21	16.13	16.26

B. Effect of Temperature

The optimum temperature for the fermentation process of *Candida tropicalis* was determined by carrying out the fermentation of SLs at various temperatures ranging from 20 to 45^0C was

carried out in a 5 litre bench top fermenter at various temperatures.

Table 2: Effect of different temperature on SLs production by *Candida tropicalis*

Temperature	**20^0**	**25^0**	**30^0**	**35^0**	**40^0**	**45^0**
Sls (g/L)	17.12	17.16	28.13	19.28	16.31	15.89

C. Effect of Incubation Period

The optimum incubation period for the fermentation process of *Candida tropicalis* was determined by carrying out the fermentation of SLS at various incubation periods ranging from 3 to 8 days.

Table 3: Influence of various incubation periods on SLs production by *Candida tropicalis*

Incubation periods (days)	**3**	**4**	**5**	**6**	**7**	**8**
Sls (g/L)	10.13	17.13	19.32	19.91	25.62	25.62

D. Speed of Agitation

The optimum speed of agitation for the fermentation process of *Candida tropicalis* was determined by carrying out the fermentation of SLs at various speeds of agitation ranging from 100 to 500 rpm.

Table 4: Influence of various speeds of agitation on SLs production by *Candida tropicalis*

Speed of agitation (rpm)	**100**	**200**	**300**	**400**	**500**
Sls g/L	21.49	28.13	18.18	17.13	15.82

CONCLUSION

Sophorolipids can be used for recovery of metals for polluted water ways and use of bio fertilizers and Biopesticides. The cultural conditions such as pH, temperature, incubation period and speed of agitation were determined by small scale bench top 5L fermenter (Murhopye scientic, LF). The optimum pH for Sophorolipid production was found to be 30.43 g/L at the pH 3.5. There was a drastic reduction in the yield when the pH is either lower or higher. At 30^0C the maximum yield was 28.13g/L, The optimum Incubation period was 7days for a maximum yield of 25.62 g/L. From our study the study of speed of agitation we obtained higher yield at 200 rpm when compared with other speed of agitation.

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