OPTIMIZATION OF CARBON (C) SOURCE ON THE GROWTH OF HYDROCARBON DEGRADER AROBES

Preeti Singh and *Dr. Ajit Pandya

Department of Bio-chemistry, C.U Shah Science College, Ashram road, Ahmedabad.

ABSTARCT

Carbon is thought one of the most important factors for optimization of any microbial process. Certain microbes prefer simple sources like glucose, sucrose, lactose, mannose and other simple sugars, but in case of complex compound, they tend some time for adaptation. The principle objective of study is to degrade the crude oil, still the other sources were used. Sucrose has shown steady increase in the growth of microorganisms up to 72 hrs. Surprisingly Bacillus species was found least efficient. In case of glucose growth of microbes was increased gradually with time up to 48hrs for most of the cases. After that reduction is observed in Halomonas daqingensis PS13 and Parapusillimonas granuli PS14.

KEYWORDS: Carbon, Growth, *Parapusillimonas* granuli PS14, *Halomonas daqingensis PS13, Bacillus species,*

INTRODUCTION

Certain microbes prefer simple sources like glucose, sucrose, lactose, mannose and other simple sugars, whereas certain microbes can utilize polymers in addition to simple sources. (Prescott 2002; Atlas 1993; Roy et al. 2007; Onuoha et al. 2011) There were many studies which have revealed that a group of microbes are also capable of utilizing tedious compounds like crude oil, PAH, hydrocarbons. (Das & Mukherjee 2006; Hanson et al. 1997; Prabhakaran et al. 2014; Al-Hadhrami et al. 1996) When microbes are allowed to grow on simple sources they grow exponentially, but in case of complex compound, they tend some time for adaptation. This adaptation is intracellular synthesis of degrading enzymes responsible for degradation of complex compound. This is the reason for longer lag phase in such cases. This

phase could be from 6 hrs – 48 hrs depending on the microbes and source of carbon. (Vincent et al. 2011; Kafilzadeh et al. 2010; Kafilzadeh et al. 2012).

MATERIALS AND METHODS

Carbon is thought one of the most important factors for optimization of any microbial process. Growth of any microbe or even growth pattern is highly dependent on carbon sources used. (Bardi et al. 2000; Hamzah et al. 2010; Adibarata & Achibana 2009; Prabhakaran et al. 2014) Here, four carbon sources were optimized. These sources are glucose, sucrose, yeast extract and crude oil. 1.0% of each of these sources were inoculated in BH media and allowed to grow at 37ºC for 72 hrs. Optical density of all the combination was measured at every 24hrs at 600nm on spectrophotometer using media blank. However the principle objective of study is to degrade the crude oil, still the other sources were used to determine the compatibility of these microbes with other most commonly available sources.

RESULTS AND DISCUSSION

Carbon source is the key element for the growth of any microorganism. Each microbes has ability to consume number of carbons sources, however the utilization pattern may vary. From the obtained results it was found that yeast extract is the most efficient carbon source for the growth of all the microbes during the first 24 hrs. Upon extension of incubation period rapid decrease in the growth was observed. This effect is seen because yeast extract contains many components which are essential for the growth of microbes along with carbon source. These components include certain proteins, peptides and other growth promoters. These components are readily available in the media resulting into increase rate of microbial production.

In case of glucose growth of microbes was increased gradually with time up to 48hrs for most of the cases. After that reduction is observed in *Halomonas daqingensis* PS13 and *Parapusillimonas granuli* PS14. Sucrose has shown steady increase in the growth of microorganisms up to 72 hrs. As compare to other sources, crude oil was found least preferred source for microbial growth. All the microbes were able to grow on crude oil but as compare to other three sources the rate was found very less. Maximum growth was obtained after the incubation of 72hrs. The reason behind lesser growth is slow degradation of crude oil. This slower degradation results into slower liberation of monomers required for the growth and development of microbes.

Maximum degradation of crude oil was achieved by *Pseudoxanthomonas Mexicana* with optical density of 0.823 at 600nm followed by *Halomonas daqingensis, Parapusillimonas granuli* and *Bacillus cereus.* Surprisingly *Bacillus* species was found least efficient; otherwise in the most of the study it has shown a very potential effect. If only biomass is concern then either glucose or sucrose will be preferred but in this study the main aim was to degrade crude oil hence it was preferred as carbon source and rest on the parameters standardize accordingly.

Result Table Effect of various carbon sources on the growth of microbes

Carbon Source	24 hrs	48 hrs	72 hrs
Bacillus cereus PS11			
Glucose	0.440±0.018	1.320±0.078	2.143±0.103
Sucrose	0.216±0.022	1.166±0.066	1.781±0.089
Yeast extract	1.568±0.051	1.353±0.075	0.825±0.066
Crude oil	0.344±0.022	1.325±0.016	0.393±0.016
Pseudoxanthomonas mexicana PS12			
Glucose	0.529±0.041	1.224±0.077	1.925±0.121
Sucrose	0.370±0.023	1.333±0.092	1.542±0.079
Yeast extract	1.316±0.067	1.560±0.106	1.523±0.088
Crude oil	0.357±0.021	0.377±0.025	0.823±0.054
Halomonas daqingensis PS13			
Glucose	0.763±0.051	1.862±0.102	1.739±0.078
Sucrose	0.359±0.024	1.236±0.087	2.179±0.121
Yeast extract	1.510±0.084	1.209±0.068	0.924±0.086
Crude oil	0.373±0.022	0.452±0.032	0.754±0.054
Parapusillimonas granuli PS14			
Glucose	0.822±0.041	1.971±0.078	1.964±0.079
Sucrose	0.298±0.012	0.532±0.032	1.720±0.025
Yeast extract	1.281±0.069	1.915±0.089	0.762±0.034
Crude oil	0.272±0.009	0.320±0.012	0.549±0.021

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