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A STUDY ON BIOSURFACTANTS FROM CASSAVA AND SWEET POTATO PEELS USED IN BIOREMEDIATION

Mrs.M. Meenakshi Assistant Professor, Department of Microbiology, Sri Ramakrishna College of Arts & Science for Women.

ABSTRACT Biosurfactants have a wide range of industrial applications including enhanced oil recovery, bioremediation, industrial emulsification, medicine, food preservatives, health care industries, cosmetic industries and cleaning toxic chemicals of industrial and agricultural origin. They also has several properties of therapeutic and biomedical importance, such as antibacterial, antifungal and antiviral properties. It has great potential for biotechnological and biopharmaceutical applications. Among the bacterial genera, Bacillus sp (Gram-positive) and Pseudomonas sp (Gram-negative) have received the most attention because they produce a wide range of effective biosurfactants that are useful for agricultural, chemical, food and pharmaceutical industries Biosurfactants are synthesized by microbial fermentation process using water-soluble compounds, cheap agro based substrates and waste materials such as glucose, sucrose, ethanol or glycerol, cassava peels, This project focuses on the production of biosurfactant. Biosynthesis of biosurfactant is important because they are cost effective and grows in cheap cultural media and are eco-friendly. In this present research work the biosurfactant is produced from bacteria using cassava peel and sweet potato peel as substrates for enhancing bioremediation in polluted areas.

KEYWORDS : Biosurfactants, Cassava peels, Bioremediation, Fermentation, eco-friendly

INTRODUCTION

Biosurfactants are indispensable components of daily life and are structurally diversegroup of surface active amphiphilic biological compounds produced extracellularly or as part of the cell membrane by microorganisms such as bacteria, yeast and filamentous fungi.

It contain both hydrophobic groups (their tails) and hydrophilic Biosurfactants are indispensable components of daily life and are structurally diverse group of surface active amphiphilic biological compounds produced extracellularly or as part of the cell membrane by microorganisms such as bacteria, yeast and filamentous fungi (Ananda raj et al., 2010). It contain both hydrophobic groups (their tails) and hydrophilic groups (their heads). Therefore a bio surfactant molecule contain both water soluble and water insoluble compounds Microorganisms which produce bio surfactants are isolated from sites which present or were contaminated by petroleum hydrocarbons. The total biosurfactant production has exceeded 2.5 million tons in 2002 for many purposes such as polymers, lubricants and solvents. Low-molecular-weight biosurfactants reduce the surfacetension at the air-water interfaces and interfacial tension at oil-water interfaces, whereas the high molecular weight biosurfactant are more effective in stabilizing oil-in-water emulsions called bioemulsifiers Therefore a biosurfactant molecule contain both water soluble and water insoluble compounds.

Microorganisms which produce biosurfactants are isolated from sites which present or were contaminated by petroleum hydrocarbons. The total biosurfactant production has exceeded 2.5 million tons in 2002 for many purposes suchas polymers, lubricants and solvents. Low-molecular-weight biosurfactants reduce the surfacetension at the air-water interfaces and interfacial tension at oil-water interfaces, whereas the high molecular weight biosurfactant are more effective in stabilizing oil-in-water emulsions, called bioemulsifiers Water treatment easy to perform but soil bioremedation is is relativelymuch more difficult and complex.The first problem arises due to difficulties in treating soil, especially when pollution is distributed over a large area.

The removal of soil from contaminated site becomes a costly undertaking, even though such ex situ treatment might bewell established. This could be accomplished in two ways: (i) Addition of nutrition to the soilin form of nitrogen, phosphorus, carbon compounds, which would allow the native microbial population to develop and augment, and thus provide more microorganisms for metabolism(ii) Produce ex situ a microbial population which is adapted to the pollutant and add thispopulation, along with necessary nutrients, to the polluted soil. The added biomass underproper conditions, would be able to survive in the soil and further degrade objectionable organics.

Various hydrocarbons can be used as substrate like Diesel, petroleum, kerosene,engine oil, lubricant oil, castor oil, peanut oil, vegetable oil, plant derived oils like sunfloweroil, oil wastes like soapstock, oil refinery wastes etc.

Biosurfactants has the ability to display versatile performance and exerts its toxicity on the cell membrane permeability bearing the similitude of a detergent like effect because of its diverse structures. Gharaei-Fathabad reported that several biosurfactants have strong antibacterial, antifungal, antivirus activity and they play the role of anti adhesive agents to pathogens making them useful for treating many diseases as well as its use as therapeutic and probiotic agent. Biosurfactant produced by marine *B. circulans* had a potent antimicrobial activity against Gram positive and Gram negative pathogens and Semi pathogenic microbial strains including MDR strain.

Figure 1: Cassava peels (Dried form)

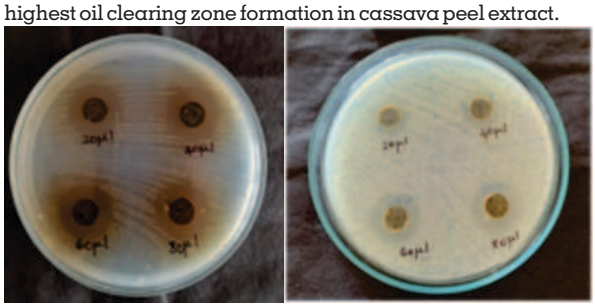
Applications Of Biosurfactants

The worldwide production of surfactants increased upto 17 million metric tones in 2000 (including soaps) expected future growth rates of 3-4% per year globally. These chemicallysyn the sized surfactants are mainly petroleum based , non

biodegradable and remain toxic to the environment. Also these compounds may bio-accumulate and their production processes and by-products can be environmentally hazardous. Due to this increasing awareness on the need to protect the ecosystem, environmental scientist have necessitating an increased interest in microbially produced biosurfactant as possible alternatives to chemically synthesized ones.

CASE STUDY

Extraction of biosurfactant was done and cell free broth was obtained for screening methods. Emulsification test was performed, it shows that the emulsification activity of Bacillus sp were high in sweet potato peel extract when compared to other carbon sources. Oil screening test was performed for extracted biosurfactants. Among this Bacillus sp produces the highest oil clearing zone formation in cassava peel extract.



Bacillus in Sweet potato peel extract ,

Pseudomonas in Cassava peel extract

CONCLUSION

The cassava peel extract and sweet potato peel extract produce more amount of biosurfactant when inoculated with *Bacillus* sp compared to *Pseudomonas* sp and has effective antimicrobial activity.

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