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Isolation of Serratia Liquefaciens as Metal Resistant Bacteria from Industrial Effluent

R. Ramya
Department of Biotechnology
Bharathiyar University, Coimbatore,
Tamil Nadu
ramyamarimuthu2010@gmail.com

Dr. M. Boominathan
Department of Botany
Kunthavai Nachiyar Government Arts College, Tanjore,
Tamil Nadu
boomi_26@yahoo.com

Abstract: Sample from industry effluent consist of various metal like lead, zinc, copper, silver, mercury etc. The growth of microorganisms is affected by various factors like temperature, PH, salinity etc. In some cases there are some microorganisms which can tolerate the presence of metal like lead, zinc, copper, silver, mercury etc., presence of these metal is analysed by atomic adsorption spectrometry method ,present study deals with isolation of Serratia liquefaciens is done by various biochemical characteristics ,various parameter analysis, culturing of Serratia liquefaciens in the bacterial growth medium which consist of artificially supplemented with metal .From the study, it is confirmed that Serratia liquefaciens is present in the polluted water where metal dust persists in the effluent sample. Serratia liquefaciens were resistant to metal and these microorganisms are further encouraged to degrade metal in the sample.

Keywords: Lead, Zinc, Copper, Silver, Mercury, Atomic Adsorption Spectrometry, Parameter, serratia liquefaciens.

INTRODUCTION

Heavy metals are a group of metals persist in nature and consequently tend to accumulate in food chains. Although relatively high levels of these elements occur in the natural environment, their presence as a contaminant in ecosystems results mainly from anthropogenic activities (Vaituzis Z,1985).The toxic effects of heavy metals on microorganisms are influenced by a multitude of factors such as pH, the concentration of chelating agents, speciation, and organic matter (Duxbury T, 1986).The presence of those elements in the environment can result in impacts on ecosystems, with alterations in the biomass, diversity of microbial communities and cycling of elements (Sobolev D., Begonia M.F.,2008).Heavy metals such as nickel, iron, copper, and zinc are essential to metabolic reactions and are required as trace elements by the organisms. Others like mercury, silver, and cadmium have no biological role and are harmful to the organisms, even at very low concentrations (Hughes M.N., Poole R.K.,1989).Bacteria that demonstrate the capacity of surviving in toxic heavy metals concentrations have been isolated from different sources (Choudhury P, 1998).Many bacteria have specific genetic mechanisms of resistance to toxic metals. In the environment, metals may select these resistant variants in a manner similar to the selection of antibiotic resistant strains (Owusu V.I., Tang J.C. 1984).Indeed, it is relatively common the association of metal and antimicrobial resistance, since both resistance genes are frequently located on the same mobile genetic elements (Foster T.J, 1987). Consequently, it can be assumed that the selective pressure exerted by heavy metals contribute to the indirect co-selection of antibiotic resistance (Gerischer U,2008) particularly in environments contaminated with the two elements. Concerning heavy metals, terms such as “resistance” and “tolerance” are arbitrary and they are often used as synonymous in literature. Gadd G.M., 1992 suggested using the term "resistance" when it is possible to characterize a specific mechanism of bacterial detoxification for a metal. Therefore, the term tolerance seems more appropriate to refer to the ability of a bacterial strain to grow in the presence of high concentrations of a metal, in all cases in which the mechanism of this process has not been investigated.

The toxic effects of heavy metals on microorganisms are influenced by a multitude of factors such as pH, the concentration of chelating agents, speciation, and organic matter (Duxbury T, 1986). The presence of those elements in the environment can result in impacts on ecosystems, with alterations in the biomass, diversity of microbial communities and cycling of elements (Sobolev D., Begonia M.F.2008, Roane T.M., Pepper I.L.,1999).Despite the large number of papers describing the action of heavy metals on microorganisms,(Momba MNB et al 2006) there are few studies on the effects of toxic metals in the physiology of metal tolerant bacteria, (Furman C.R., et al,1984) in comparison to those about their inhibitory or deleterious effects on susceptible organisms (Gupta L.K et al,19992, Vaituzis Z et al,1975). Additionally, metal tolerant Enterobacteriaceae strains were investigated for their resistance to antimicrobial drugs, intending to study the possible relationship between metal tolerance and antimicrobial resistance (Madigan M and Martinko, 2005).

In our work, we analyzed the presence of metal tolerance in bacteria from sewage, and some effects of heavy metals on microorganisms that are able to survive and grow in their presence. It relevant to evaluate the possible interactions between these toxic elements and tolerant bacteria in regard to the physiological and metabolic alterations derived from this contact, because it can be important, for example, in situations such as in the utilization of metal tolerant microorganisms for bioremediation of contaminated environments (Tavana A M., 2008).

This study is part of a broader investigation which aims to obtain data about metal tolerant bacteria Serratia *liquefaciens* considering their potential use for bioremediation, as well as about the impact resulting from the interactions between metals and metal tolerant bacteria.

MATERIALS AND METHODS

- The sample was collected from the different zone of the industry effluent were in untreated form pH of the sample has been checked using **pH** meter.
- BOD sample has been checked to ensure favourable growth condition of the bacteria
- COD of the sample has been verified – it involves using strong oxidizing chemical, potassium chromate-To oxidize organic matter in solution to carbon dioxide and water under acidic condition.
- Serial dilution was done, Nutrient agar plates were added with various consistency that help in the growth of metal resistant bacteria
- Nutrient agar was inoculated with sample after dilution.
- The plates were incubated for 24 hours
- Biochemical characterization was performed indole test, MR test, VP Test, citrate utilization test, urease test, oxidase test, nitrate reduction test, Mannitol test, Sucrose test, arabinose test, were done to know characterization of metal resistant bacteria

RESULT AND DISCUSSION

PH of the sample which has been checked it was ranged between 6.3-7.4. BOD of the sample which has been checked it was ranged between 245-415 mg/l. COD of the sample which has been checked it was ranged between 556-850 mg/

Biochemical Characteristics of the Metal Resistant bacteria

Colonies from the nutrient agar plates supplied with metal, after preparation of pure culture, were characterized according to Bergy's manual of bacteriological classification. Identification of metal resistant bacteria using biochemical characterization is shown in Table.1

TABLE 1: Biochemical Characteristic of Metal Resistant Bacteria Present in the Industrial Effluent Sample

S. No	Name of the test	Result
1.	Indole test	Negative
2.	MR test	Positive, Negative
3.	VP Test	Positive
4.	Citrate utilization test	Positive
5.	Urease test	Different reaction occur
6.	Nitrate test	Positive
7.	Arabinose test	Positive
8.	Oxidase test	Negative
9.	Mannitol test	Positive
10.	Sucrose test	Positive

These biochemical characterization of the metal resistant bacteria was identified as S*erratia liqufaciens*. It can tolerate the presence various metal like lead, zinc, copper, silver, mercury etc.

CONCLUSION

S*erratia liquefaciens* was one of the metal resistant bacteria which was isolated from the sample collected from the industrial effluent which has metal pollutant.It was analysed by PH, BOD, COD, biochemical characterization .further the S*erratia liquefaciens* act as the potential microorganisms to degrade metal in the environment and make the environment free from pollution

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