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Short Communication

Heavy metal contaminant degradation from environment using potential agents

Joshi Anushri[1], Desai Ajay[2], Mehta Kavit[2*], Bhatt Keyur[2] and Jain B.K.[3]
[1]Department of Geography, Shri Haridas Kalidas Arts College, Ashram Road, Ahmedabad, Gujarat-380009, India
[2]Mehsana Urban Institute of Sciences, Ganpat University, Ganpat Vidhyanagar, Mehsana, Gujarat-384012, India
[3]M.G. Science Institute, Navarangpura, Ahmedabad, Gujarat-380009, India
kavitmehtabiotech@gmail.com

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Abstract

Today, environmental pollution is a huge problem because of hazardous waste, inadequate drinking water and restrictions on soil crop production. Use bioremediation to clean contaminated water and soil. In these processes, as a source of nutrients or energy remediate pollutant. Bioremediation is field application for environment sciences. The main research is bioremediation, biotransformation kinetics, co-metabolism, biogeochemical assessment technology modeling, and attenuation and environmental fate models. Heavy metals are present in the earth's crust and can be dissolved in groundwater by natural processes or changes in soil pH. Heavy metal pollution of wastewater. Perhaps the whole world is facing serious environmental problems. Our research is reflected in the remediate and degradation of heavy metals from waste. It produces a various toxic compounds. For biological agents, degradation increases concerns about removal of heavy metals, with high level and low cost. Isolated bacterial species have great potential for producing large amounts of biomass, which are widely used for metal adsorption of Pb, Zn, Cd, Cu, Cr, As and Ni. Biomass production offers great potential for the use of metal recovery systems. This article describes the use of biological agents to degrade heavy metal contaminants to find solutions to overcome heavy metal problems.

Keywords: Bioremediation, geochemical, heavy metal, remediation, biotransformation.

Introduction

The soil is heterogeneous mixture of micro and macro nutrient and minerals.

According to Perezde Mora[1] *et al.* It is a necessary resources for daily requirement such as food, fibre and shelter etc. These sources depend on properties of soil i.e. clay content and pH[2]. It exhibits a repository of heavy metal to the hydrosphere, and atmosphere. In nature plays a central role in cycling of metals.

It is released from various electronic sources like computer and electronic gazettes may finally reach to the topsoil. When degradation to heavy metal and precursor were release into soil. Once released in to soil in which strongly bind to soil particle. These element degradation by plant uptake or movement down soil profile. Soil pervert with low concentration of heavy metal.

According to Puschenreiter[3] *et al* affect to crops and produce acute toxicity but the long-term effect causes chronic damage to animal as well as human health. Microorganism as a sensitive indicator to change ecosystem. Microbial parameters used to quantify soil and wastewater activities include soil microbial biomass, respiration, activities of enzymes, as well as heavy metal etc.[4].

Various environmental pollutions i.e. air, soil and water effect on plants, animals, humans, natural vegetation and productivity of ecosystem[5].

According to Shuman[6] *et al.* different pollution a decrease soil productivity in soil by long-term exposure of heavy metals. In soil different reactions of biochemical and metabolic conducted by micro-fauna and micro-flora[4]. This research represents degradation of heavy metal changes in soil.

Different pollution happens with various biological and chemicals agents including heavy metals. It is a big problem that may have negative consequences on the biosphere. The most abundant pollutants were heavy metals[7].

Human activities such as mining operations and discharge of industrial wastes have resulted in the accumulation of metals in the environment and eventually accumulated through the food chain, leading to ecological severe and health problem effected to human health.

Athar[8] *et al*. around earth surface's area-wide distributed sources like food and fruit waste. It caused an adverse effect on human health. The isolated organism produced a various bioactive metabolite that ability to reduce pollution to the environment.

Under this study by using isolated organism from fruit and food wastes reduced heavy metal pollution.

Material and methods

Collection of Sample: Location for sample collection was near to fruit juice vendor at shopping complex, Ganpat Vidhyanagar, Mehsana. Location was selected randomly at the place where there was a frequent disposal of fruit waste (i.e. at the stall of fruit juice vendor). About 10gm soil was collected from different depth using a sterile spatula and collected in a sterile container. Collected sample was transferred to laboratory of Mehsana Urban Institute of Sciences, Mehsana.

Enrichment technique: Soil samples was transferred to laboratory immediately and stored at 4◦C. A series of culture tubes containing 9ml of sterile water were taken to followed by serial dilution up to 10^{-5} were made. From each dilution [10^{-1} to 10^{-5}] 0.1ml of suspension was spread on Glucose Asparagine and incubated at 37 °C for 96 -120 hours and observed pinpoint colonies which showing characteristic of organisms with clear zone around it, picked and purified it.

Screening technique: All isolates was subjected to primary screening by four flame streaking method on modified GAA medium at 28ºC for 4 to 5 days .After screening selected isolates was inoculated into glucose asparagine medium using sector plate technique and incubated at 28ºC for 4 to 5 days. All isolates was confirmed by Gram reaction and biochemical test.

Degradation of heavy metal by using isolated organism: Isolated organism was inoculated into Glucose Asparagine Agar with 0.25ml of broth culture in each tube thoroughly mix with inoculum and keep piece of metal "Cu" into medium. One medium used as control without inoculated where no metal added and other inoculated with metal and Incubate at 30°C at 48 hr.

Removal of heavy metal by using conventional techniques: According to Qazilbash[9] *et al* Different clean-up techniques suggested for removal of heavy metals using various methods i.e. chemical, physical or biological. There were several conventional technologies and chemical methods used to remove heavy metal ion from pollutant area. Because of their toxicity and mutagenicity crucial issue for health and ecological threats.

Results and discussion

Based on colony characteristics, a total of 4 isolates, each isolates with significant areas showed degradation of the contaminants. After purification isolated of pure culture, designated as isolates 1 and 2. They maintained a pure culture on the Glucose Asgargine stored with 4°C.

This isolates using degradation of waste containing source i.e. Cu.

Table-1: It Showing Characteristics of isolate.

Colony characteristics	Isolate	
	Isolate 1	Isolate 2
Gram's Reaction	Gram Positive rods	Gram Positive rods
Size	Big	Small
Shape	Irregular	Irregular
Edge	Wavy	Wavy
Elevation	Slightly raised	Slightly raised
Consistency	Dry	Dry
Surface	Rough	Rough
Odor	Earthy	Earthy
Optical characteristics	Opaque	Opaque
Pigmentation	Non pigmented	Non pigmented

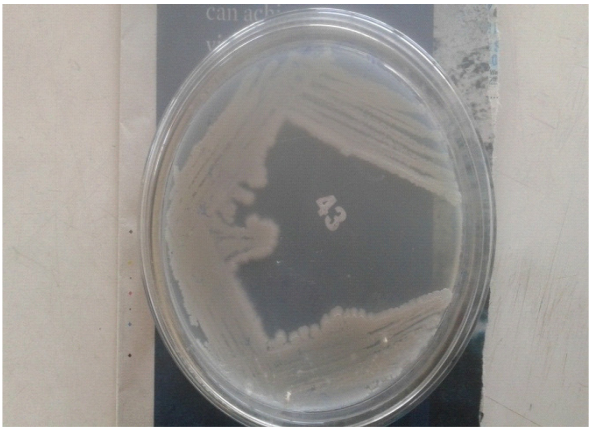

Figure-1: Isolate 1.

Figure-2: Isolate 2.

Both isolate 1 and 2 isolated from waste containing soil which used as degradation of metal containing pollutents.

Table-2: Identification of Isolates using biochemical methods.

Name of Test	Isolate 1	Isolate 2
Indole	Positive	Positive
Methyl Red		
Voges-Proskauer		
Simmon's Citrate	Negative	Negative
Urease	Positive	Positive
Catalase		
Starch Hydrolysis		
Hydrogen Sulphide	Negative	Negative
Gelatin Liqification		
Carbohydrate Fermentation		
Glucose	Acid & Gas	Acid & Gas
Lactose		
Maltose		
Mannitol		
Sucrose		
Phenylalanine Agar	Negative	Negative
TSI agar slant		
Glucose	Fermented	Fermented
Lactose		
H_2S	Negative	Negative
CO_2	Positive	Positive

Isolate-1 Isolate-2

Figure-3: Effect of Heavy Metals and it showing degradation zone of Copper using isolates.

Table-3: Degradation zone of diameter (mm).

Isolate	Copper (diameter shown in mm)					
Isolate 1	25	27	25	45	45	48
Isolate 2	34	27	33	34	34	34

Soil collected from different areas with frequently disposal of waste occurred heavy metals. These samples further process and obtain desired isolates. Based on the characteristics of colonies, a total of 4 isolates obtained in a further screen to an isolate with a transparent degradation zone on cooper. These isolates was an excellent glucose fermenter. All of them turned out to be gram positive. Most of isolates use lactose, maltose, mannitol and sucrose. Based on preliminary screening, these isolates showing similarities look alike *B. subtilis*. Isolate one was more potent compared with isolates two. These isolates showing degradation zone of cooper. These are potential degrading agents for the removal of contaminants of cu.

Conclusion

Innovative processes for the waste containing heavy metals in order to reduce them. In order to microbial treatments to decrease it. Our studies widely applied to the metal-contaminated wastes using microorganisms. However, in the near future, the most promising methods for dealing with such complex systems will induce the degradation of pollutants. Another ways, among conventional methods, this is most potent methods for treating contaminates. It is major aspects to depending on the process used, provide conditions and, is the key factor in choosing the most appropriate treatment for inorganic effluents.

References

1. de Mora A.P., Ortega-Calvo J.J., Cabrera F. and Madejón E. (2005). Changes in enzyme activities and microbial biomass after "in situ" remediation of a heavy metal-contaminated soil. *Applied Soil Ecology*, 28(2), 125-137.

2. Oyedele D.J., Gasu M.B. and Awotoye O.O. (2008). Changes in soil properties and plant uptake of heavy metals on selected municipal solid waste dump sites in Ile-Ife, Nigeria. *African Journal of Environmental Science and Technology*, 2(5), 107-115.

3. Puschenreiter M., Horak O., Friesl W. and Hartl W. (2005). Low-cost agricultural measures to reduce heavy metal transfer into the food chain–a review. *Plant Soil Environ*, 51(1), 1-11.

4. Nannipieri P., Grego S. and Ceccanti B. (1990). Ecological significance of the biological activity in soil. *Soil biochem*., 6, 293-355.

5. Ladd J.N., Foster R.C., Nannipieri P. and Oades J.M. (1996). Soil structure and biological activity. *Soil biochemistry*, 9, 23-78.

6. Shuman L.M. (1999). Organic waste amendments effect on zinc fractions of two soils. *Journal of Environ.Qua*., 28, 1442-1447.

7. Moreno J.L., Garcia C. and Hernandez T. (2003). Toxic effect of cadmium and nickel on soil enzymes and the influence of adding sewage sludge. *European Journal of Soil Science banner*, 54(2), 377-386.

8. Athar R. and Ahmed M. (2002). Heavy metal toxicity, effect on plant growth and metal uptake by wheat, and on free living *Azotobacter. Water, Air and soil Pollution*, 138, 165-180.

9. Qazilbash A.A. (2004). Isolation and Characterization of Heavy Metal Tolerant Biota from Industrially Polluted Soils and their Role in Bioremediation. *Biological Sci*., 41, 210-256.