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Research Article

**A GREEN TECHNOLOGICAL METHOD: ASSESSMENT AND  
ELUCIDATION OF MERITS AND DEMERITS OF BIO-  
REMEDIAL ACTION TO RECYCLE POLLUTED AREA**<sup>1</sup>Dr. Urva Musaddiq, <sup>2</sup>Dr. Mavra Akhtar, <sup>3</sup>Dr. Muhammad Nouman Khan<sup>1</sup>King Edward University<sup>2</sup>Sir Gangaram Hospital Lahore<sup>3</sup>Div. HQ's Teaching Hospital Mirpur, AJK**Abstract:**

*This study is aiming at the assessment and elucidation of advantages and disadvantages of such bio-remediation action for the recycling of polluted area. The environment in modern life has entered the zone where it exposes too many dangers and this issue has become the talk of the town. This realization of biological and organic issues due to industrious wastages aware many countries to face the removal of lethal outcomes. In this regard, mycoremediation has played a vital role, especially, to deal with the danger of poisonous materials like phenolic offshoots. On one hand, the fungus has the properties to consume such wastages because it has to convert the complex body materials into the simple substances. Many types of research have reported the validation of this phenomenon. This technique is very useful for the reversion of strong poisonous materials to less harmful one. Moreover, it also reduces the contamination of soil. Numerous researches with multiple experiments coded that fungi are the right substitute for the removal of lethal substances from soil and water. Because fungi are the great consumer of such materials. To destabilize the efficacy of biological substances white rot fungus are the suitable remedial enzyme. These white rot fungus, having some biological reactions, discharges enzymes which carry certain effects that prove the death for large organic materials. The enzymes produced by fungi have universal operations that are equally disastrous for all kinds of materials. The fungi that excrete enzymes contains lignin peroxidase [LiP], manganese [MnP] and some kinds of hydrogen peroxide (H<sub>2</sub>O<sub>2</sub>). Some other kinds of carbon like straw in the victimized area added into the process of destabilization improve the desired outcomes.*

**Keywords:** Remediation, Fungi, Pollutants and Environment.**Corresponding author:****Dr. Urva Musaddiq,**  
King Edward University

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**INTRODUCTION:**

Industry and urbanization have revolutionized the world and devastating developments are taking place around the globe which created the lethal effects for natural resource. Some other troubles like ecological have injured space and time. Therefore, new techniques and methodologies under the force of innovative approaches are required to face a challenge of the modern world's problem. In this regard, biotechnology became the guiding star to protect the health of the environment. Similarly, microbiology introduces bio-remediation which is the finest remedy for the polluted regions.

*Pollution:* Industrial wastage, kitchen wastage, a leftover of food and home articles become the source of environmental pollution. In addition to these substances, agricultural wastage- chemicals and poisonous stuff discharge from the fertilizer companies make the situation worse. Organic and inorganics contaminated fluids also an aggressive addition to the poor environment. These industrial noxious substances make underground water contaminated. Sometimes such contaminated water adds the proportion of noxious chemicals to the food which has the roots deep in the soil. Some contaminants like dichlorodiphenyltrichloroethane [DDTs] and polychlorinated biphenyls [PCBs] belonging to halogens family such as dechlorane plus [DP], [2,4,6-tribromophenoxy], ethane [BTBPE], Hexabromobenzene [HBB] and polybrominated diphenyl ethers [PBDEs] are detected in seafood chain especially in China where ecological process was taken placed in the region of pollution. These contaminated areas can be handled in 3 ways- Detection of a contaminated site, identification of contaminating substance and the suitable method as an encounter. The needs for elimination of contamination lead the world to introduce new technologies.

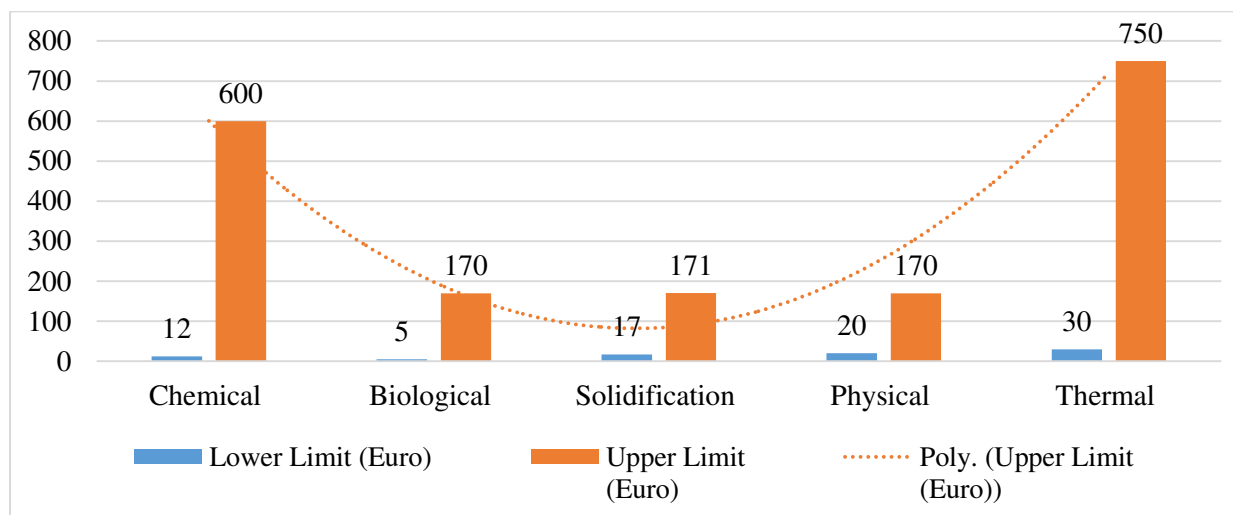
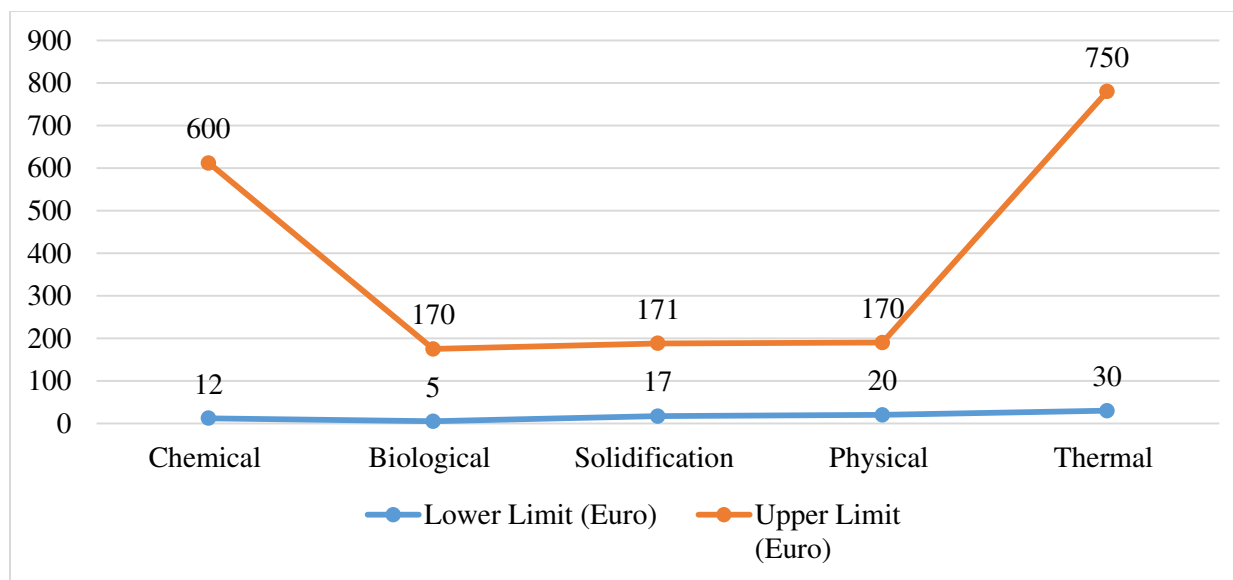
*Bioremediation:* The word "Bioremediation" is self-explanatory to find the techniques for the degradation of wastage biologically. It requires the cultivation of microsystem that could have the ability to degenerate the polluting substances. Different nature of pollutants requires different bioremediation methods. For example, hydrocarbons, sewage drain wastage, plastic, fertilizer industrial chemicals, gases, hard metals and chlorinated materials. In this regard, numerous researches based on bioremediation dedicated their attention on hydrocarbons which are the root cause of pollution in soil and underground water. There are some microbes like Mycobacterium, Pseudomonas, Rhodococcus and sphingomonas which reacts for biodegradation in collaboration with oxygen. Such microbes have intrinsic power for degradation. The small organic particles consume the contaminants to regain the energy and accelerate their own growth.

Due to the lack of oxygen, these microorganisms degrade the pollution. Polychlorinated biphenyls [PCBs] are the right choice for the elimination of contaminants. Additionally, the ligninolytic fungus is the other kind of fungi which can also vitiate devastatingly a great numbers of poisonous toxins. Few recent types of research on the said issue explored the reduction of crude oil in the reservoir.

*Characteristics of Bioremediation:* The process of bioremediation is largely in fashion for the sanitization of soil, freshwater, groundwater, poisoned echo system and marine system. The initial application of counteractive activities was designed for the purification due to petroleum hydrocarbons which change it to the chemical stuff which was not dangerous for the environment and the soil rather it increased the suitability for the crops.

**Table – I:** Bioremediation techniques in terms of cost-effectiveness

Treatment	Lower Limit (Euro)	Upper Limit (Euro)
Chemical	12	600
Biological	5	170
Solidification	17	171
Physical	20	170
Thermal	30	750



*Pros and Cons of Bioremediation:* Though the innovative idea of bioremediation for the degradation of contaminating materials, but it has some pros and cons for consideration.

**Table – II:** Biochemical Classification and their ability to biodegrade

Chemical class	Examples	Biodegradability
Polyaromatic hydrocarbons	Toluene	Oxygen (Presence & Absence)
Ketones & esters	Propanone	Oxygen (Presence & Absence)
Petroleum hydrocarbon	Oil	Oxygen (Presence)
Chlorinated solvent	Trichloroethane	Oxygen (Presence)
Polychlorinated biphenyls	Arochlors	Methanotrophs Anaerobic (reductive dechlorination)
Metals	Lead	Not degradable
Radioactive materials	Uranium	Not degradable (Biologically)
Corrosives	Caustic soda	Not degradable (Biologically)
Asbestos	Resins	Not degradable (Biologically)

*Advantages and Disadvantages of Bioremediation:*

There are numbers of advantages to using the process of bioremediation as compare to other sources like landfilling. Moreover, it can also work in collaboration with other chemical based techniques. Same likewise the other chemical processes and technologies it has some disadvantages. Firstly, it sometimes does not humiliate the complex compounds and the substances with composite structures. Secondly, it may increase the reaction of the toxin. So, one must evaluate its cast and reliability before its application.

**CLASSIFICATION OF BIOREMEDIATION TECHNOLOGIES**

In general, it may be categorized as insituorex-situ. This technology deals with the regimens in order to remove the contaminants apparently. It is also called as recycling process. Ex-situ and in-situ are the antithesis to each other. Therefore, some areas suit

the process of ex-situ and the whole procedure of degradation may take place without any obstruction in the systematized treatment.

*A consortium of Microbes for Bioremediation Technique:* There are multiple disciplines involved in the elimination of contaminants like geology, soil science, chemical engineering, environmental science and biotechnologies. According to many researchers, it is inevitable to evaluate the performance of advanced technologies. Following evaluations cycle can be helpful.

*Daily:* It involves the parts of systems like valves piping, temperature pumping machine rate, flow and pumps.

*Monthly:* The above-mentioned examinations provide comprehensive data as a monthly record.

*Quarterly:* The entire collected observations, assessments and evaluation reports will help to achieve the desired outcomes.

**Table – III:** Bioremediation treatment technologies

Bio-augmentation	In a contaminated area, bacterial culture harvesting, with the help of “ex-situ” remediation method.
Bio-filtration	Microorganism use in a bioreactor for air pollution treatment.
Bioreactors	Microbial degradation in a fermenter that aids in the liquid contamination treatment.
Bio-stimulation	In groundwater or soil, contamination remediation which is carried through the cultivation of microbial with the addition of extra nutrients, both situ and ex-situ.
Composting	Involvement of the aerobic process to harvest emerging agent and contaminated compounds mixture.
Bioventing	Polluted land treatment through thawing oxygen to mediate microorganism growth and its function.
Mycoremediation	Degradation method of hazardous compounds with the fungal species growth which uses the compounds as a source of energy.

**PRINCIPLES OF GREEN TECHNOLOGY**

It is a branch of Chemistry that deals with the eradication of toxins from the production of chemical compounds. Green technology provides a complete guideline for numerous problems. Many engineers, doctors, scientists and chemists believe that by following the principles of green technology many deadly compounds can abolish and makes the environment healthy.

*Introduction to Fungi:* Fungi has the natural

resources those are helpful to rundown the chemical bond of contaminants. In the forests, leaves cover the floor with the seasonal changes which are not consumable for any plant rather it limits the growth of other small plants. Therefore, this is fungi that consume it. Fungi is a blessing of God that consume the wood and other acids and enzymes.

*Mycoremediation:* Many types of research revealed that fungus and its family plants are helpful to

consume environmental pollutants that include acid, chemicals, hard materials and petroleum spills. A systematic utilization of fungus known as mycoremediation.

#### APPLICATION OF MYCOREMEDIATION

*Utilization of Domestic Batteries:* Domestic electronic appliances are increasing rapidly. It requires the fast development of the industry. Mainly, these appliances operate with internal or external batteries. Such batteries comprise of those cells which work with electrolyte water and chemicals. Leakage in the cells and batteries produces loss of chemicals that make the components and surrounding contaminants.

*Soil Contamination and Mycoremediation:* Crude oil is the main reason to make the soil contaminant. Most of the industries discharge these crude oils and do not have any proper disposal. Moreover, 90% of the machinery is working on diesel and petroleum which makes the environment polluted causing leakage from grounded tanks, pipelines, improper disposal of chemicals, landfills leaching and accidental spills.

*Waste Water Slush:* Wastewater slush is another reason for contamination. Management has funded a lot in this regard. The remedy for wastewater mud is drying with sunlight, utilization in the fields, disposal of land, landfilling in incineration and sea disposal.

*Paper Pulp Waster and Mycoremediation:* Paper industry is also famous as a polluted industry. It has become part of the environmental global research, by the dint of polluting the environment. It involves many biological and chemical substances so it is multifaceted. In this regard microorganism is the best economic and environmental substitute for the degradation of ecological harms e.g. Polychlorinated biphenyl, Petroleum Hydrocarbons, Pesticides, Heavy Metals and Phenol Derivatives.

#### CONCLUSION:

The environment in the modern world has been polluted ecologically due to urbanization and industrialization. Polychlorinated biphenyls, organic and inorganic contaminants, chemical hydrocarbons, pesticides and herbicides are the biological contaminant that has created lethal hazards for animals and human beings.

In order to eradicate such pollutants, mycoremediation is the handful and attractive option that uses some physical and chemical processes for the degradation of contaminants. Moreover, it is not harmful to the inhabitants. Somehow, the application

of mycoremediation technique has some limitations, especially where the compounds have more complex structures. This study elucidates the modern technology for the exclusion of pollution from the environment instead of examining the heavy literature on the said problem. As a result, mycoremediation and bioremediation weigh many important qualities on disadvantages. Therefore, it is difficult to deal with the number of disciplines e.g. biochemistry, marine science, environmental science and microbiology.

To conclude, these all disciplines lie in manufacturing biochemical process. These all disciplines provide the framework of technology as well as the conclusion to the deprivation of environmental pollution.

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