

“Solid Waste Management by Phytostabilization Techniques”

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Abstract- The industrialization and globalization of india has contribute to the increase rate of solid waste generation. In India total solid waste is generated and only 32% treated and the rest is dumped. This waste content heavy metals and Toxic content which are to be remove from the environmental cycle. Various remedies have been adopted for overcoming this situation. Phytostabilization is an advance technique to solve this problem. The activities are used in large scale areas with heavy metal should mainly focus on decreasing the degree of metal mobility in soil profile and metal bioavailability to level that are not phytotoxic. Phytostabilization is the process in which soil amendment and plants used to immobilize metals.

Keywords –Phytostabilization, Remediation, Phytotoxic, Amendments.

1. INTRODUCTION

Solid waste means any garbage, refuse, sludge from waste water treatment plant, water supply treatment plant, air pollution control facility & other discarded materials including solid, liquid, semi-solid or contaminated gaseous material, resulting from industrial, commercial, mining & agricultural activities.

In the other words, we can say that solid waste is the unwanted or useless solid material generated from human activities in residential, industrial, commercial areas. It may be categorized in three ways.

Origin (domestic, industrial, commercial, constructional or institutional)

Contents (organic materials, glass, metal, plastic, paper, etc.)

Hazard potential (toxic, non toxic, flammable, radioactive, infectious, etc)

1.2 Objectives of the study:

- (1) The main objective of this project is to reduce the level of heavy metal from solid waste.
- (2) This different type of accumulator has been used like brassica juneca, canna indica, carica papaya, Momordica charantia, catharmthus roseus.
- (3) To identify different impurities in solid waste present in dumping ground.
- (4) To introduce the concept of no landfill viz. zero landfill.
- (5) To design model (pot) for experimental research work.

2. REVIEW OF LITERATURE:

2.1 Introduction

The various research programs are carried out for the Solid waste management. Many researches are done for improving properties of solid waste by adding different chemicals in waste. Following section reviews literature on the similar studies. In following, reviews are group together for simplicity as use of plants and chemicals to improve soil stability. These are as follows.

2.2 The phytostabilization process on heavy metal polluted soil

Anna Grabelak, Anna Napora, (2015) have done a intensive work and published a research article on “The Chemophytostabilisation process on heavy metal polluted soil.” The main objective of this study was to investigate the effect of soil organics & inorganic amendment of Cl, Pb, Zn conducted with fescue grass. The practical aim of this research is to limit the migration of micropollutant (metal) into the ground water in large areas that are contaminated with heavy metals The fertilizing effect of sewage sludge from the foot industry acts as a substantial improvement in the scorpion capacity of soil, as a week as enrichments of N, P and organic matter.

2.3 Use of Recycled with take back product

Shagun, Ashwini Kush and Anupam Arora, (2013) have discovered the proposed solution to E-waste Management. The major reasons of E-waste generation. The proposed solutions given are recycling with take back product; adopt consultative process, disposal fee for manufacturers and consumers. The paper concludes that the customer should move for upgrading their electronic device to latest version rather than buying new equipments.

2.4 Use of Plants for Municipal Solid Waste

A Rumyantseva, M. Berezyuk, N. Savchenka and E. Rumyantseva, (2017) had done a intensive work and publish a research article on "Modern technology of processing municipal solid waste" The problem of effective municipal solid waste (MSW) management is known to all the municipal entities of Russian federation.

The problem is multifactor and complex. The author of paper suggests a project of a plant for processing municipal solid waste into combustible gas with the help of high temperature pyrolysis. Pyrolysis is process of decomposition of the substance into simpler components, which is implemented under high temperature stress with the lack of air. During gasification process residue transforms into gas under the effluence of atmospheric oxygen or steam. The inorganic residue received after the gasification should be disposal in special landfills.

2.5 Use of Chemical Compounds and Plants

Lee A Newman and Charles M Reynolds(2004) had done a intensive work and published a research article on "Phytodegradation of organic compound." The main finding of this study was the process of phytodegradation of organic compound can take place inside the plant or within the rhizosphere of plants. Many different compounds and classes of compound can be removed from the environment by this method including solvent in groundwater, petroleum and aromatic compound in soil and volatile compounds in the air. The aim of paper is to reduce contaminants by using various plants such as Poplar, Brassica, Canna etc by various process such as metabolism, volatilization, rhizosphere effect and increased greenery by phytoremediation..

2.6 Process of Transpiration and root growth

Nanthi S. Balan, Jin Hee park, Brett Robinson, Ravi Naidu and Keun Young Hub(2011) had done intensive work "Phytostabilisation: A green approach to contaminant containment." The finding of this paper, phytostabilisation involves the establishment of plant on the surface of the contaminated site with the aim of reducing the mobility of contamination by roots or immobilization within vadose zone through accumulation by root or immobilization within rhizosphere, there by reducing off site contamination. This process includes transpiration and root growth that immobilize contaminant by reducing leaching, controlling erosion, creating an aerobic environment in root zone and adding organic to the substrate that bind the contaminant and micro bioactivity assisted with the plants may accelerate

3. Experimental setup

3.1 material were use in experiment

3.1.1.Plants and Chemicals

3.1.1.1. Plants

The Plants use for experimental work are Bressica Juncea, Carica Papaya, Canna Indica, Momordica Charantia, Cathramthus roseus.

3.1.1.2. Chemicals

The chemicals are used for solid waste treatment work are BSU UPJAU Granules, Neem powder, HS6-H catalyst, UPJAU-Humic, UPJAU-Immunerizer

The above mentioned chemical is soil conditioner. It is an eco-friendly, non-toxic product. It nourishes the soil and improves the roots zones of plants. It also act as root fixer which help to grow roots faster and healthy.

Every chemical ingredient vary in different chemicals, some of ingredients are same in chemicals. These are all ingredients from above mentioned chemicals using for experimental work.

Ingredients in Chemical

Sr. No.	Ingredients	Content	GGBS
1	Active Humic	16%	39.84
2	Seawood	20%	38.00
3	Ashwagandha	15%	7.52
4	Satawari	15%	0.31
5	Balamool	15%	10.54
6	Triphal	35%	0.32
7	Humic Acid	50%	0.38
8	HS6	50%	0.16
9	Tulsi	6%	1.42
10	Chitrak	6%	554
11	Vacha	6%	0.16
12	Maritha	6%	1.42
13	Bel	6%	554
14	Adulsa	6%	0.16
15	Kadaksinghi	6%	1.42
16	sitaphal	6%	554
17	Gulvei	6%	3.00

3.2 Tests on material

3.2.1 pH

3.2.2 Conductivity

3.2.3 C: N ratio

3.2.4 Flammability

3.2.4 Toxicity content:

- 1) Lead
- 2) Cadmium
- 3) Mercury
- 4) Chromium
- 5) Arsenic
- 6) Nickel
- 7) Zinc
- 8) Copper

3.3 Methodology

3.3.1 Selection of Site

3.3.2 Selection of Sampling Points

3.3.2.1 Initial Test

3.3.2.2 Toxic Content

3.3.2.3 pH

3.3.2.4 Conductivity

3.3.3 Manual Design of Pot

3.3.4 Selection of Plants and Chemical for This Technique

3.4. Treatment method for Solid waste

The following are the treatment method for solid waste:-

I. Thermal treatment (incineration)

It is the combustion of waste in the presence of oxygen, so that the waste is converted into carbon dioxide, water vapour & ash.

II. Pyrolysis and gasification

In this method, the thermal processing is complete absence of oxygen or less amount of air.

III. Biological treatment method

Micro organisms are used to decompose the biodegradable components of waste.

1. Aerobic digestion

This needs the presence of oxygen and includes window composting, aerated static pile composting and in vessel composting, vermiculture, etc.

2. Anaerobic digestion

This process is takes place in absence of oxygen.

IV. Landfills and open dumping

It is uncontrolled disposal of waste on land where waste is dumped exposing to natural elements, stray animals and birds.

Table No. 1: Mix Proportions of 20% soil and 80% waste

Plants	Standard seeds Germination Period	Duration of Survival of plant sample	Chemical Dosing	Result
Bressica Juncea	10	6	1 in a Week	Survive
Carica Papaya	35	7	1 in a week	Not Survive
Canna Indica	12	5	1 in a week	Not Survive
Momordica Charantia	8	10	1 in a week	Not Survive
Cathramthus Roseus	10	6	1 in a week	Not Survive

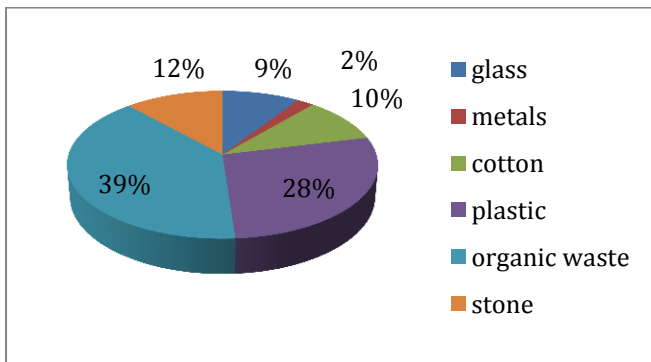
Table No. 2: Mix Proportions of 30% soil and 70% waste

Plants	Standard seeds Germination Period	Duration of Survival of plant sample	Chemical Dosing	Result
Bressica Juncea	10	12	1 in a Week	Survive
Carica Papaya	35	20	1 in a week	Not Survive
Canna Indica	12	8	1 in a week	Survive
Momordica Charantia	8	15	1 in a week	Not Survive
Cathramthus Roseus	10	13	1 in a week	Not Survive

Table No. 3: Mix Proportions of 40% soil and 60% waste

Plants	Standard seeds Germination Period	Duration of Survival of plant sample	Chemical Dosing	Result
Bressica Juncea	10	15	1 in a Week	Survive
Carica Papaya	35	23	1 in a week	Not Survive
Canna Indica	12	12	1 in a week	Survive
Momordica Charantia	8	10	1 in a week	Not Survive
Cathramthus Roseus	10	8	1 in a week	Survive

4.0 Segregation of Solid waste



CONCLUSIONS

After analyzing and studying the test results the following conclusions were drawn:

1. From the results of initial test on solid waste it is concluded that there is presence of heavy metals like arsenic, mercury, nickel, etc.
2. From the plant growth table it can be concluded that due to high carbon nitrogen ratio the sample proves to be very hazardous and most of the phytostabilization plants like Ricinus Communis, Brassica Juncea Momordica Charantia, Carica Papaya failed to survive.
3. The plants which survived were Bressica juncea (mustard seed), Catharamthus Roseus and Canna Indica.
4. From the results of final test on solid waste it is concluded that the amount of nickel is reduced up to 55%.
5. Arsenic is removed 100% with the help of phytostabilization technique.
6. Lead removed 60%
7. The conductivity has been reduced from 16.74 to 3.38

8. Organic carbon has been reduced Nickel content has been reduced.

ACKNOWLEDGEMENT:

We are very much thankful to all the people who help us directly and indirectly. Successful completion of this work can't be possible without time-to-time guidance and help from Assistant Prof. Yuga. R. Galinde and Faculty of Civil Engineering Department of G.M. Veda Institute of Technology.

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