Garbage Enzyme Solution – An Effective Alternative As A Surface Cleanser

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ABSTRACT: A multipurpose solution for domestic and agricultural uses has been identified as "garbage enzyme solution". It is a fermentation product of jaggery, kitchen trash, and water in a proportion of 1:3:10. The effects of dilutions (5 percent to 75 percent) of waste enzyme, which can be employed for a variety of purposes, are investigated in this study. The pH of the garbage enzyme solution (GES) was discovered to be between 4.5 and 6.5.It is a multi-component preparation that has been described as multipurpose solution. Garbage enzymes have been used as a cleanser, deodorizer, insect repellent, soil conditioner, insecticide, and fertiliser as per the study.. The main findings showed that GE was acidic in nature, with citric acid being a significant component. Citric acid, sugars, proteins, alcohol, and enzyme activity such as protease, amylase, lipase, and papain were found in biochemical analyses of GES preparations. As a result, this investigative support the use of GES as a multipurpose liquid. Garbage enzyme is an environmentally beneficial alternative to commercial cleaning products that pollute water and harm the environment.

KEYWORDS: Garbage Enzyme, Leachate Pollution Index, Waste Minimization, Fermentation, Characteristics.

1. INTRODUCTION

The problem of sewage disposal and industrial waste management has grown increasingly urgent as the global population grows [1].The level of living in emerging countries is improving day by day, resulting in an increase in per capita solid waste creation. The level of the landfill rises as municipal solid waste (MSW) output rises. In developing countries like India, garbage separation is a necessary effort, making landfilling a regrettable but essential choice. In comparison to composting and incineration, the landfill is a more common waste management solution due to its economic feasibility.[3]According to a report published by the Central Pollution Control Board in 2016, roughly 80% of collected solid trash, or 108,000 metric tonnes per day, is thrown at landfills on a regular basis.[5] The creation of landfill leachate is caused by a number of causes, including physical, chemical, and biological interactions, high moisture content in the trash, rainwater percolation, and water contact with solid waste. Ammonia, organic chemicals, inorganic compounds, natural and manmade ligands, xenobiotics, xenophobic organic substances, biological organisms, poisonous and heavy metals are all found in landfill leachate. The composition of leachate varies depending on the hydrology of the landfill, the type of trash, the composition of the waste, the climate, and the age of the landfill. The main causes of landfill leachate percolation into the soil and groundwater are insufficient treatment and poor management at disposal sites. Because the features of leachate change over time, it is vital to discover an appropriate treatment approach [7].

Organic waste management and disposal are currently a serious issue all over the world. As a result, it is common practise to just discharge waste into the environment without any treatment, which can have a direct or indirect impact on the environment. As a result, decomposable waste that is typically discarded into the environment can be used to produce a huge number of value-added bio products, reducing the quantity of greenhouse gas produced. One such product is garbage enzyme solution, which is a complex organic solution including protein chains, mineral salts, and juvenile hormones. It also serves to breakdown, convert, and catalyse the reaction. It has a wide range of applications because it is a multi-hydrolytic enzyme. Polluted water sources are one of our society's key issues, and they have a negative influence on human health and the environment [8].

2. METHODOLOGY

Process of preparation of Garbage Enzyme solution:

A large batch of garbage enzyme had been produced for this study, from the methodology and recipes published in the media, using clean water without chlorine content. To produce about 10L of garbage enzyme, 3kg of vegetable and fruit biomass was fermented together with 1kg brown sugar and 10L water for three months. The fermentation yielded a brownish liquid, which was separated from the solids.

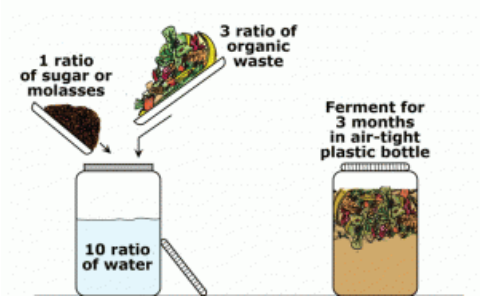

Fig. No.1. Garbage Enzyme Production

Table No.1 Proportion of water, Jaggery, Garbage

Brown sugar, molasses sugar or jaggery	Fruits and vegetable	water
1 kg	3 kg	10 liter
300 gm	900 gm	3.0 liter
10 kg	30 kg	100 liter

Fermentation:

Garbage enzyme is the product of fermentation of vegetable/fruit wastes in a mixture of water and brown sugar after a period of 3 months. The brown sugar that is metabolized by bacteria turns into alcohol which is subsequently reduced to acetic acid or vinegar.

Filtration:

Garbage enzyme is separated from the solid residues by filtration. The obtained enzyme solution was light brownish yellow coloured. It was transferred to plastic bottles and stored in a cool and dry place. The residue obtained can be used as a fertiliser due to its high nutritious content. We prepared following four number of samples with different organic waste.

SAMPLE 1: Garbage Enzyme solution made from orange (700 gm: 2100 gm: 7000 ml)

SAMPLE 2: Garbage Enzyme solution made from Tamarind (200 gm :600 gm : 2000 ml)

SAMPLE 3: Garbage Enzyme solution made from Tomato (500 gm :1500 gm : 5000 ml)

SAMPLE 4: Garbage Enzyme solution made from Lemon (200 gm: 600 gm : 2000 ml)

Fig.No.2 Various Garbage Enzyme Solutions

3. RESULT AND DISSCUSION

Micro-organisms (bacteria, fungi) are the main degradation organisms, both in the soil and in the compost. Each organism itself is so small that it cannot be observed with the naked eye. Micro-organisms are unable to absorb food particles. They digest their food externally. Enzymes are secreted through the cell walls of the micro-organisms into the surrounding area.

The degradation enzymes, brought into the soil by the micro-organisms in the compost, are breaking the waste into proteins, fat, cellulose, wood dust, and other compounds. The waste is now being softened ("rotten", "decayed") and the nutrients absorbed through the cell wall of the micro-organisms making them thrive.

Field test for agriculture waste:

Result of Composting test

After mixing Garbage Enzyme solution with agricultural waste, volume of waste goes on decreasing, which is identified by daily observation of height of heap, as marked in table no 2

Table No.2. Result of Composting test

Day	Height of garbage heap (cm)
1	100
2	90
3	87
4	84
5	80

To Deodorize air:

Working: Diluted and sprayed into a room from a bottle, it removes odour from the air. Ozone produced in the creation of Garbage Enzyme kills air-borne bacteria and increases oxygen levels in the air.

Ratio: 1 litre water in 5 ml garbage enzyme used.

Apply: First take 1 litre of water in a plastic bucket and add 5 ml of garbage enzyme and mix it after adding the solution for 20 minutes, then it is filled in spray bottle and used it in many days closed room in the evening.

Result: After one hour of spraying in the closed room, it was observed that the dirty smell of the room was gone and it felt that the amount of oxygen increased.

Floor cleaning:

Working: Add 2 table spoon of garbage enzyme in the floor cleaning water will clean the floor and kill bacteria.

Ratio: 1 litre water in 5 ml garbage enzyme used

Apply: First of all, we take 5 litres of water in a bucket and mixed 25ml of water and left that solution for 20 minutes and after that we wiped the tiles.

Result: After half an hour, after seeing an insect, the insect was destroyed and there was a slight glow in the floor and a smell of aroma was created.

Cleaning kitchen:

Working: Use diluted. It can effectively clean most stubborn kitchen stains. Pour it into the sink and let it sit overnight to keep your drains running freely.

Ratio: 1 litre water in 10 ml garbage enzyme used

Apply: First, take 2 litre of water in a plastic bucket and mix 20 ml of garbage enzyme and add put aside the solution for 20 minutes and then the solution cleared the kitchen.

Result: After half an hour, it was seen that in the cooking house, the smell of ginger, onion and spices disappeared and the insect was destroyed.

Cleaning toilet:

Working: Use Garbage enzyme to wash the toilet, can prevent clogs, destroy harmful bacteria, dirt and clog will break down by the enzyme. Repels mosquito, cockroach and rats.

Ratio: 1 litre water in 500 ml garbage enzyme used

Apply: First of all take a litre of water in jar and mix a litre of garbage enzyme and put aside for 24 hours and then put it in the toilet.

Result: After 24 hours it was seen that the toilet looked quite clean and the dirty habitat was completely gone.

Fertilizer and Pesticides:

Working: Water plants with water with some diluted enzyme added to help plants grow more healthily, and reduce pest attacks. Watering barren ground can be revived when it is constantly watered with enzyme treated water for three months.

Ratio: 1 litre water in 20 ml garbage enzyme used.

Apply: After taking 1 litre of water in a plastic bucket daily and adding 20 ml of garbage enzyme in it, after mixing it, then put the solution aside for 20 minutes, then it is filled in bottle. The solution we sprayed on tree in the garden, we performed 15 days every day.

Result: After 15 days it was found that the trees we used on the garbage enzyme were found to be greenish and some of their trees had increased.

COST ASSESSMENT:

Table No.3. Material Cost

Material	Cost
Jaggery	Rs. 40 Per Kg
Fruit and vegetables	Rs. 10 Per Kg
water	Rs. 0.3 Per Ltr

Approximate cost of preparation of GE solution is approximately 10 Rs/lit

Uses:

Agriculture uses

To reduce the usage of chemical fertilizers.

To keep the farm free from insects and infections.

As a soil fertilizer for vegetable growing.

As a natural pesticide and herbicide.

To convert sandy land to fertile farm land.

Domestic uses:

As a general household cleaning liquid.

To remove foul odours, molds and grime in the kitchen and toilet.

As an anti- bacterial and anti-viral agent.

To drive away insects.

To clean carpets and remove ticks.

Advantages:

Saves the ozone, save yourselves.

The production of garbage enzyme releases O3 molecules, which is what the ozone layer is made of. Therefore, by making garbage enzyme, we are saving earth's ozone layer. By saving the ozone layer, we can reduce the many harmful effects of the suns ultra- violet rays, such as the occurrence of skin cancer.

Minimizes waste

Making garbage enzymes minimizes the amount of waste produced by a household because many waste products, such as peels of fruits and old vegetables can be used to make the enzyme.

Saves cost

Garbage enzyme can be used as a cleaning agent. It can be used to wash dishes, clean toilets, as well as to wash hair. Therefore, a lot of money can be saved from buying washing liquid and shampoo.

Multiple Usage

Natural household cleaner, air purifier, detergent, car wash, organic fertilizer etc.

Reduce Pollution

Methane gas released from garbage can trap 21 times more heat than co_2 worsen than global warming condition

Disadvantages:

Preparation time:

It requires more time for making of enzyme.

Proportion: As the proportion gets varies result may not be found as expected.

Dos and Don'ts when making/using Garbage Enzymes:

1) Use an airtight plastic container, and not metal or glass ones which can't expand as gases build up within the container, and may explode. Even with the plastic container, it's important to open the lid once a week or once every few days during the first month and stir.

2) Store the container in a dry and cool area away from direct sunlight. Keep the GE at room temperature and don't store inside a refrigerator.

3) Use any combination of fresh veggie or fruit peels or dregs. I personally prefer a combination of pineapple, papaya and citrus peels. Do not use cooked food, meat or fish, or other non-food items like paper, metal, glass, plastic and so on.

4) Don't worry about the white, black or brown substance that forms as a layer on top of the enzyme. The white layer is yeast that is rich in Vitamin B complex and Vitamin C and can actually be used for making bread or roti.

5) If you see worms, add an extra ratio sugar and cover air tight. They will disappear by themselves.

6) You may filter out the residue after 3 months using a sieve or even and cotton cloth or T-shirt. If you can wait for 6 months, it's even better. There is no expiry date for the GEs once filtered.

7) Reuse the residue, as a fertilizer in the garden by drying and mixing with the soil, or combining it with fresh veggie/fruit dregs as a starter for a new GE batch.

8) Dilute the GE with water for most uses. This increases its effectiveness. Dilution is especially important when using as fertilizers or pesticides for plants, where high concentrations can prove too acidic for them.

4. CONCLUSIONS

1) Garbage enzyme solution is an economical solution for cleaning of different surfaces as compared to chemical cleansers available in the market, therefore it's production on commercial scale should be encouraged.

2) It is observed that GE solution prepared using citrus fruit like orange, lemon & sweet lemon gives the best results for cleaning the dirty surfaces like floors, toilets, & furniture etc.

3) For floor cleaning : 5 ml of GE solution mixed in one liter of water gives best result.

4) For kitchen cleaning: 10 ml of GE solution mixed in 1 liter of water gives best result.

5) For soil fertilizers: 200 ml GE solution mixed in 1 liter of water gives best result.

6) For pesticides : 100 ml of GE solution mixed in 1 liter of water gives best result.

7) For composting solid waste :1 liter GE solution in 5 liter of water gives best result.

8) To deodorize air : 5 ml GE solution in 1 liter of water gives best result.

5. REFERENCES

[1] Fazna Nazim, V. Meera, 2013 Treatment of Synthetic Greywater Using 5% and 10% Garbage Enzyme Solution. Journal of Industrial Engineering and Management Science. 3(4), 111-117

[2] Nayak, Jyotiprakash G., Patil,L. G., Patki, Vinayak K.,2020. Development of water quality index for Godavari river (India) based on fuzzy inference system. Groundwater for Sustainable Development. doi: https://doi.org/10.1016/j.gsd 2020.100350

[3] Yuek Ming Ho, Leong Kee Ling, Latifah Abd Manaf , 2014. Garbage Enzyme as a Solution to Waste Minimization. Journal of Public Health Research and Development. 9(10), 347-350.

[4] Nayak, Jyotiprakash G., Patil,L. G.,2016. Assessment of water quality of Godavari river at Nashik, Maharashtra, India. International Journal of Civil Engineering and Technology. 7 (1), 83-92.

[5]Aishwarya Rani, Suraj Negi, Athar Hussain, Sunil Kumar, 2019. Treatment of Urban Municipal Landfill Leachate Utilizing GE. Journal of Bio-resource Technology. 10.1016/j.biortech.2019.122437.

[6] Nayak, Jyotiprakash G., Patil,L. G.,2015.A comparative study of prevalent water quality indices in streams. International Journal of Engineering and Advanced Technology.4(3), 208-212.

[7] Samriti, Sajal Sarabhai, Arti Arya 2019. Garbage enzyme: A study on compositional analysis of kitchen waste ferments. The Journal of Pharma Innovation. 8(4), 1193-1197.

[8] Fu E. Tang, Chung W. Tong, 2011. A Study of The Garbage Enzyme`s Effects in Domestic Wastewater. Journal of Water and Health. 5(12), 1143-1148.