

USE OF GARBAGE ENZYME FOR TREATMENT OF WASTE WATER

Deepak verma¹, Dr. Anoop Narain Singh², Prof. A.K. Shukla³

*1M.Tech. Department of Civil Engineering,
Institute of Engineering and Technology, Lucknow*

2Dept of Civil Engineering, Rajkiya Engineering College, Azamgarh

3Dept of Civil Engineering, Institute of Engineering and Technology, Lucknow

ABSTRACT

Garbage enzyme is obtained by fermenting fruit and vegetable wastes. This alternative method of biological recovery of organic waste may provide a Solution to waste minimization and reduction since a large proportion of municipal solid waste consists of food waste. Use of garbage enzyme is an effective method of treatment of wastewater.

To investigate the effectiveness of garbage enzyme application as an alternative method in sewage treatment by measuring TS, TSS, TDS, phosphorus, ammonia and BOD before and after application of enzyme.

Garbage enzyme is produced by brown sugar, fruit wastes and water in ratio of 1:3:10. From the test results for pure garbage enzyme, it is concluded that it is acidic, and does not contain ammonia nitrogen, phosphorus.

This paper analyzes the utilization of garbage enzyme as an alternative method for wastewater treatment or aid to the conventional STP method. The % reduction in TS, TSS and TDS in wastewater sample is noted after treatment with different proportion of garbage enzyme. Garbage enzyme is mixed with wastewater in different proportion (i.e. 0%, 5%, 10%

,20 % and 25%) and after 5 days % reduction in TS is found as 5.13, 82, 89 & 85 respectively. With the same proportions and days % reduction in TSS is 83, 94, 90, 92 and % reduction in TDS is 4.9, 80,89,87. Result shows that garbage enzyme accelerates the digestion process of organic content.

Further the experiments need to be done to analyze the effect of garbage enzyme on BOD. Also experiments required for the optimum proportion of enzyme to be mixed with wastewater to get desired results.

Garbage enzyme is a value added bio-product which is made by decomposable waste. This paper analyzes the utilization of garbage enzyme as an alternative method for wastewater treatment or aid to the conventional STP method. The % reduction in TS, TSS and TDS in wastewater sample is noted after treatment with different proportion of garbage enzyme.

Garbage enzyme is mixed with wastewater in different proportion (i.e. 0%, 5%, 10%, 20 % and 25%) and after 5 days % reduction in TS is found as 5.13, 82, 89 & 85 respectively. With the same proportions and days % reduction in TSS is 83, 94, 90, 92 and % reduction in TDS is 4.9, 80,89, 87. Result shows that garbage enzyme accelerates the digestion process of organic content. Further the experiments need to be done to analyze the effect of garbage enzyme on BOD. Also experiments required for the optimum proportion of enzyme to be mixed with wastewater to get desired results.

Keywords- *Wastewater treatment, garbage enzyme, TDS, TS, BOD, Ammonia and Phosphorus.*

INTRODOCTION

Domestic sewage is one of the major point source pollution specially in Indian society. The waste water from households are directly discharged in to rivers or any natural streams which pollutes the river and the natural streams. According to a survey in India there is not sufficient waste water treatment plant as per requirement. So the use of garbage is an alternative solution for treatment of waste water. Garbage enzyme are protein molecule which catalyse the chemical reaction which are taking place in waste water. Garbage enzyme used for treatment of waste water is a very eco-friendly and sustainable way treatment of waste water because organic wastes are used in the making of garbage enzyme which catalyse the rate of chemical reaction in waste water. So organic wastes which disposed in open area causes nuisance to the environment are used in making the garbage enzyme to treat the waste water. Garbage enzyme is a complex solution produced by the fermentation of fresh kitchen waste (fruit and vegetable peel), sugar (brown sugar or molasses) and water. It is dark brown and has a strong sweet sour fermented scent. Garbage enzyme is a multipurpose liquid and its applications covers household, agriculture, animal husbandry, gardening etc. It is a complex organic substance of protein chains and mineral salts and juvenile hormones. The functions of Garbage is to resolve (decompose), transform (change), and catalyse the reactions.

The treatment of waste water with garbage enzyme is in very low cost as compared to the conventional waste water treatment because organic wastes are available in plenty and molasses or brown sugar are easily available in low cost. The only disadvantages of garbage enzyme is that its takes approx. three months for preparing. Due to increase of population the management of organic wastes from households are critical. The effective treatment of municipal waste water occurs only in urban areas while in rural or village area there is not sufficient sanitation and treatment of waste water available so for these areas the treatment of waste water from the garbage enzyme will be very economical. Seventy to eighty percent of Indian river are getting pollution due to discharge of waste water. That's why treatment of waste water with garbage enzyme is very eco-friendly for rivers as well for environment.

Enzymes are protein molecules that catalyse chemical reaction. They act as biological catalysts and catalyze only specific molecules (substrates). Enzymes are selective for substrates and catalyze only one or a small number of chemical reactions among many possibilities. However they are physiologically important because they speed up, by at least 1000-fold, the rates of reactions by decreasing the amount of energy required to form a complex of reactant, known as the transition state complex, that is competent to produce reaction product.

Garbage Enzyme (GE) is an organic solution produced by the simple fermentation of fresh vegetable waste, brown sugar and water, in much the same process that wine is made. This

fermentation creates a vinegar-like liquid with natural proteins, mineral salts and enzymes that make it magnificently multipurpose in and out of the home.

MATERIALS AND METHODS

Orange peels and water were mixed together in the ratio of 1:3:10 to prepare Garbage Enzyme. The mixing process was done in an air-tight plastic container which was able to expand. During the first month, gases were released during fermentation process. Pressure built up in the container was released daily to avoid rupturing. Orange peels were pushed downward every once in a while. The container was placed in a cool, dry and well ventilated place. It was left to ferment for 3 months to produce enzyme. The fermentation yielded a brownish liquid, which was separated from the solids. The solution was filtered after 3 months to obtain enzyme solution. A white mould formation was observed on the top surface of the solution. These may be B complex Yeast and vitamin C Yeast. The obtained enzyme solution was of light brownish yellow coloured. It was then transferred to a plastic bottle. Enzymes will never expire. The longer you keep, the stronger it becomes. The power of the enzyme will be enhanced when water is added to it. Garbage Enzyme is only for external use. It should not be stored in a refrigerator.

The characteristics of pure Garbage Enzyme solution were analysed in Bio-tech park immediately after filtration of the enzyme solution (after 3 months of fermentation period). Batch test was carried out to determine the effect of 5%, 10%, 20% and 25% garbage enzyme solution in treating waste water.

RESULTS AND DISCUSSION

The characteristics of pure garbage enzyme solution after 3 months of fermentation period (immediately after filtration of the enzyme solution), 30 days after filtration and 60 days after filtration are shown in Table 1

Table 1

| PARAMETER | After immediate filtration | After 30 days of filtration | After 60 days of filtration |
|------------|----------------------------|-----------------------------|-----------------------------|
| pH | 2.91 | 3.01 | 3.8 |
| TDS | 2215 | 1485 | 1121 |
| BOD | 1300 | 560 | 92.6 |
| Ammonia | BDL* | BDL* | BDL* |
| phosphorus | BDL* | BDL* | BDL* |

*Below detectable limit Garbage enzyme is mixed with wastewater in different proportion (i.e. 0%, 5%, 10%, 20 % and 25%) and after 5 days % reduction in TS is found as 5.13, 82, 89 & 85 respectively. With

the same proportions and days % reduction in TSS is 83, 94, 90, 92 and % reduction in TDS is 4.9, 80, 89, 87. Result shows that garbage enzyme accelerates the digestion process of organic content.

The characteristics of pure waste water is given below in table 2

Table 2

| Parameters | Unit | value |
|------------|--------|-------|
| pH | - | 6.10 |
| TDS | mg/lit | 563 |
| BOD | mg/lit | 190 |
| Ammonia | mg/lit | 9.5 |
| phosphorus | mg/lit | 112 |

Effluent characteristics after 27days of digestion periods

Table 3

| Parameters | 5% | 10% | 20% | 25% | Irrigation standards |
|--------------------|-----|-----|-----|-----|----------------------|
| pH | 6.8 | 6.5 | 6.3 | 5.7 | 5.5-9.0 |
| TDS (mg/lit) | 255 | 233 | 409 | 530 | 2100 |
| BOD (mg/lit) | 74 | 67 | 90 | 95 | 100 |
| Ammonia(mg/lit) | 0 | 0 | 0 | 0 | - |
| Phosphorus(mg/lit) | 0 | 0 | 0 | 0 | - |

Percentage reduction of various parameters

Table 4

| Parameters | 5% | 10% | 20% | 25% |
|--------------------|-------|-------|-------|-------|
| pH | - | - | - | - |
| TDS (mg/lit) | 54.54 | 58.79 | 27.18 | 5.50 |
| BOD (mg/lit) | 61.45 | 65.43 | 54.50 | 49.50 |
| Ammonia(mg/lit) | 100 | 100 | 100 | 100 |
| Phosphorus(mg/lit) | 100 | 100 | 100 | 100 |

CONCLUSIONS

From the study, it was found out that garbage enzyme solution was not suitable for treating waste water immediately after filtration of the enzyme solution. The enzyme characteristics were varying with time. The enzyme solution than other concentrations. The treatment time also reduced to 5 days.

The variation of enzyme characteristics with time should be monitored. Treatment of wastewater using garbage enzyme solution is found to be effective only after reduction of BOD values of the enzyme solution. Further studies are required to investigate suitable additives or activators on enzyme action. Studies on pre-treatment methods prior to enzyme action need to be explored for reduction of high initial BOD and COD. More importantly, characterization of the garbage enzyme to reveal its constituents is a critical step for any future studies.

REFERENCES

- C. Arun, P. Sivashanmugam, “Investigation of biocatalytic potential of garbage enzyme and its influence on stabilization of industrial waste activated sludge American Public Health Association (APHA), 2005. Standard Methods for Examination of Water and Waste Water, 21st ed. APHA, Washington, DC.
- Fu E. Tang, and Chung W. Tong, “A Study of the Garbage Enzyme’s Effects in Domestic Wastewater” World Academy of Science, Engineering and TechnologyInternational Journal of Environmental, Chemical, Ecological, Geological and Geophysical Engineering Vol:5, No:12, 2011
 - Arun, C. and Sivashanmugam, P., 2015. Investigation of biocatalytic potential of garbage enzyme and its influence on stabilization of industrial waste activated sludge. *Process Safety and Environmental Protection*, 94, pp.471-478.
 - Tang, F.E. and Tong, C.W., 2011. A study of the garbage enzyme’s effects in domestic wastewater. *World Academy of Science, Engineering and Technology*, 60, pp.1143-1148.
 - Nazim, F. and Meera, V., 2013. Treatment of synthetic greywater using 5% and 10% garbage enzyme solution. *Bonfring International Journal of Industrial Engineering and Management Science*, 3(4), pp.111-117.
 - Arun, C. and Sivashanmugam, P., 2015. Identification and optimization of parameters for the semi-continuous production of garbage enzyme from pre-consumer organic waste by green RP-HPLC method. *Waste management*, 44, pp.28-33