Purification of Contaminated Water Using Eco Enzyme

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Abstract. Eco Enzyme is an unpredictable arrangement formed by the fermentation of new kitchen squander, brown sugar and water. Utilization of Garbage Enzyme is developing as a viable strategy for treating contaminated water. The arrangement can be used after three months to purify the contaminated water. A message will be sent with the help of IoT once the solution is ready. Two different combinations of vegetable squanders are used and tested in the contaminated water. One solution gives better result when compared with the other solution. IoT is used to send message to the registered mobile once the solution reached required pH value. Furthermore improvements like sending message based on the application of the solution can be added in future.

1. Introduction

Because of the expansion of the overall human population, the issue of sewage transfer and modern waste administration has turned out to be progressively important. Almost 70-80% of waterways and streams convey contaminated water. Tragic effects on human wellbeing and on nature could come about if contamination of accepting waters is permitted to proceed. In order to safeguard water quality for the entire human, viable methods for tackling this issue must be created. Wastewater treatment innovation has been enhancing, it is conceivable to treat wastewater to a usable level productively and economically. Despite the fact that treatment of waste water and its performance is very much founded in urban and country territories in created nations; legitimate sanitation, with productive treatment, has not been rehearsed in numerous different spots, particularly in rural regions in creating nations like Malaysia [1].

For household wastewater treatment, the expulsion of natural contaminations and supplements is the principle need. Waste water that mixes in the river normally comprises of household waste water (50 - 90%) beginning from private sources, industry waste water (5-30%). The miniaturized scale contaminations like endocrine disruptors, pharmaceuticals and acetaminophen are available in low focuses in household waste water, they could at last respond with disinfectants from water treatment and frame unsafe items [2]. Consequently, wastewater ought to be dealt with appropriately before being released to accepting water bodies. Squander water might be re-utilized as a part of a sub soil water system territory, giving it is screened and sifted to expel hair, build up and other suspended particles.

The Waste water that is mixed with the rivers may cause the water to get contaminated. This may increase health related problems to the people those who use those contaminated water. This should be reduced some how to make the people to live healthy. The Art of Living foundation initiated the usage of this eco enzyme solution in rivers to reduce the contamination level. They used this eco enzyme solution in river Yamuna. They found that the contamination and smell of river Yamuna is
improved far better than before. In most of the foreign countries this eco enzyme solution are used to remove the algae in pond, clean the house and also to cure the wounds. As this solution is prepared in natural way, most of the people do in their home.

In order to make the enzyme preparation automatic, IoT based GSM module is used to send the message when the required level of pH value of the Enzyme is reached. The Enzyme can be used for various applications like washing clothes, cleaning house, purification of contaminated water etc. For all these applications same pH value is not needed. In future the programming can be done to send a message when the enzyme reaches the required pH for the required applications.

2. Eco Enzyme preparation

Eco Enzyme, an incredible family assistant which is a powerful family unit and clothing cleaner, air purifier, auto wash chemical and even natural compost. It is anything but difficult to make a new kitchen squander at insignificant cost, delivering successful multi-reason arrangement that is valuable and useful to the earth. Utilize cleaning items made with synthetic substances; we are dirtying the underground water, streams and the encompassing eco-framework. Regular cleaning items contain phosphate, nitrates, smelling salts, chlorine and numerous other destructive synthetic substances. The aggregated impacts of these synthetic substances that are discharged from each family unit defile the earth [3].

Mix brown sugar in water and include the kitchen squander in an air tight container. The ratio of brown sugar, vegetable squander and water is 1:3:10. Utilize just foods grown from the ground leftovers. Keep away from sleek cooked nourishment, fish or meat wastes (influence those garden to compost materials) [4]. To make crisp noticing catalyst, include orange/lemon peel. The perfect shade of eco enzyme is dull dark colour. On the off chance that the shading swings to dark include same measure of darker sugar to re-mature it. It might have white, dark or darker layer over the eco protein, overlook it. On the off chance that experience worms in the compartment, abandon it for some time can close the cover firmly [5]. Figure 1 represents the preparation of eco enzyme.

![Figure 1. Preparation of Eco enzyme solution](image)

Table 1 shows the ratio of ingredients added for preparing the eco enzyme solution.

| S.No | Ingredients              | Ratio | Measurement |
|------|--------------------------|-------|-------------|
| 1    | Brown Sugar              | 1     | 1kg         |
| 2    | Vegetable Fruit waste    | 3     | 3kg         |
| 3    | Water                    | 10    | 10L         |

After 3 months of fermentation filter the waste and collect only the liquid solution. In order to avoid smell lemon peels can be added along with the vegetable wastes [6][7]. The lid of the air tight
container has to be opened for few seconds once in every 10 days to avoid formation of gas inside the container.

3. Experimental Setup
The contaminated water which has to be purified was taken in two different vessels. Now few drops of eco enzyme are added to it and variation in the pH value of the contaminated water is noted. The pH value is noted with the help of pH meter. Figure 2 shows the block diagram of experimental setup. Figure 3 shows the experimental setup for calculation of pH value of the contaminated water. IoT is also connected with the setup so that the value will be sent to the mobile phone automatically [8].

![Figure 2. Block diagram of Experimental setup](image2)

![Figure 3. Experimental setup to check the pH value](image3)

3.1 pH Meter
A pH meter is a consistent instrument that measures the hydrogen-molecule development in liquid solutions, exhibiting its acidity or alkalinity conveyed as pH. The pH meter measures the qualification in electrical potential between a pH anode and a reference cathode; hence the pH meter is all over implied as a "potentiometric pH meter". The qualification in electrical potential relates to the acridity or pH of the solution. The pH meter is used as a piece of various applications stretching out from examine focus experimentation to quality control.

Potentiometric pH meters measure the voltage between two cathodes and show the outcome changed over into the relating pH esteem. They contain a basic electronic enhancer and a couple of anodes, or on the other hand a mix terminal and some type of show adjusted in pH units. It for the most part has a glass anode and a reference terminal, or a mix cathode. The cathodes, or tests, are embedded into the answer for be tried. Figure 4 shows the pH electrode used to measure the pH value of the water.
3.2 IoT and GSM Module
GSM module is mainly used for the communication purposes. In most of the automation project when the system need to send a message to the user this type of Modules are used. Here when the pH value of the solution is reached a message will be sent to the registered mobile using this module. Internet of Things(IoT) helps in sending the message through cloud connection [9][10].

4. Two Combination of Eco Enzyme Solution
Two different combinations of vegetables are used to prepare two different eco enzyme solutions. These solutions are added in the contaminated water to find which solution gives better result. In solution 1 carrot, brinjal, cucumber, ladies finger, beetroot wastes are used. Brown sugar is mixed with these vegetable wastes and water in the ratio of 1:3:10. Figure 5 show the solution 1 prepared using the set of vegetable waste.

In solution 2 Onion, Brinjal, cabbage, Potato wastes are used. Brown sugar is mixed with these vegetable wastes and water in the ratio of 1:3:10. Figure 6 show the solution 2 prepared using the set of vegetable waste.
5. Result and Discussion

The contaminated water is collected and used for testing. Equal amount of contaminated water is taken and few drops of eco enzyme solution prepared are added and pH value is noted for every 30 minutes. Table 2 shows pH Value of Contaminated water after adding Eco Enzyme Solution.

Table 2. pH Value of Contaminated water after adding Eco Enzyme Solution

| S.No | Time (Minutes) | pH value of Contaminated water after adding Solution 1 | pH value of Contaminated water after adding Solution 2 |
|------|---------------|-------------------------------------------------------|-------------------------------------------------------|
| 1    | 0             | 9.2                                                   | 11.2                                                  |
| 2    | 30            | 4.79                                                  | 10.05                                                 |
| 3    | 60            | 5.63                                                  | 10.3                                                  |
| 4    | 90            | 6.3                                                   | 10.5                                                  |
| 5    | 120           | 6.05                                                  | 10.4                                                  |
| 6    | 150           | 5.88                                                  | 10.7                                                  |
| 7    | 180           | 6.2                                                   | 10.9                                                  |
| 8    | 210           | 6.4                                                   | 10.8                                                  |
| 9    | 240           | 6.6                                                   | 11.2                                                  |
| 10   | 270           | 6.6                                                   | 11.2                                                  |

Figure 7 represent the pH value of the contaminated water after adding the eco enzyme solution. Based on the vegetable waste combination used the effect of the eco enzyme solutions vary. This can be seen in the table and graph.

Figure 7. pH Value of Contaminated water after adding Eco Enzyme Solution

From the Figure 7 it is identified that eco enzyme solution 1 gives better result. pH value 6.6 is near to the normal water level. When solution 1 is used, the pH value of the contaminated water decreases and slowly reaches the optimum level. But when the solution 2 is used, the pH level of the contaminated water did not show much change. So the usage of vegetables also play major role in reducing the contamination of the water.

6. Conclusion

Adding Eco Enzyme to food and water for feeding domestic animals can boost their immune system and improve the quality of poultry or meat. It takes 3 months to prepare Eco enzyme solution. The significant issue of industries is melding their unsafe concoction water into streams which makes gigantic trouble to the environment and humankind. This issue will be corrected by utilizing eco enzyme arrangement which is comprised of cost proficient natural waste treatment. Those enterprises which discharge unsafe water can bear the cost of this procedure. From the result it is found that eco
enzyme solution 1 gives better result than solution 2. The IoT module helps in sending message to the user to know that the solution reached the required pH value. In future some other vegetables will also be considered and comparison will be made to find which solution gives better result to purify water. Furthermore improvements like sending message based on the application of the eco enzymes can be added in future.

7. Reference

[1] Husain M and Husain Q 2008 Critical reviews in Environmental Science and Technology 38 pp 1-42
[2] Idris A and Azmin W N W 2004 International Conference on managing rivers pp. 363-369.
[3] World Health Organization Disposal of sullage and drainage 2011 Fact Sheet on environmental Sanitation 3
[4] Eriksson E et. al 2002 Urban Water 4 pp 85-104.
[5] Bakar K B B Master thesis University Technology Malaysia.
[6] Anjaly P S 2011 M.Tech thesis, Government Engineering College, Thrissur
[7] Fu E. Tang, and Chung W. Tong 2011 World Academy of Science, Engineering and Technology, pp 1143-1148
[8] FaizMohammed Masi, Patel Kamiyab Husain, Kurban Husain A. Masi 2018 International Journal of Maktabah Jafariyah 2 pp 1-6
[9] Singh Amrita, Gupta Ravi 2018 International Journal of Advance Research and Development 3 pp 328-331
[10] Nur Aira Abd Rahman et.al. 2017 IOP Conf. Series: Materials Science and Engineering 298 pp 1-8