



A REVIEW ON: BIODEGRADATION OF WASTEWATERDEVI Y¹, UPADHAYAY D², BHATTACHARYA I², ANDHARE P² AND MARCHAWALA F^{2*}**1:** Student, M. Sc. Biotechnology, Parul Institute of Applied Sciences, Parul University, Post Limda, Waghodia, Gujarat, 391760**2:** Assistant Professor, Parul Institute of Applied Sciences, Parul University, Post Limda, Waghodia, Gujarat, 391760***Corresponding Author:** Farhat Marchawala; E Mail: farhat.marchawala82133@paruluniversity.ac.in;

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Received 21st Jan. 2021; Revised 23rd Feb. 2021; Accepted 24th March 2021; Available online 1st April 2021<https://doi.org/10.31032/IJBPAS/2021/10.4.1029>**ABSTRACT**

This study was attempted to perceive how we can normally treat the waste water with the association of microorganisms. The problem of environmental pollution caused by industries and domestics. Mostly, organisms consume a critical part in Industrial wastewater treatment. Microorganisms are ecologically, financially and socially significant. These are being misused for a wide scope of items, e.g., compounds, probiotics, biofuels like bioethanol, hydrogen gas, and so forth from hundreds of year. The performance of isolated bacterial that help sewage treatment are *Bacillus pumilus* *Brevibacterium spp*, and *Pseudomonas aeruginosa*. BOD (Biochemical oxygen demand) used for measurement of the total amount of dissolved oxygen used by microbes in biological process of metabolizing organic molecules are present in water. COD (chemical oxygen demand) play important role in determining the quality of waster this test is based on strong oxidizing agents under acidic condition.

Keywords: Microorganisms, enzymes, wastewater treatment, BOD, COD, pH**INTRODUCTION**

Biodegraded material is used as nutrients for plants and it forms manures. Biodegradable waste are important because

of the way waste builds up in landfills and in environment. Biodegradability helps to allow natural process and maintain stability

in most natural system. Waste treatment is process in which the pollutants are removed. The ultimate goal of sewage treatment is producing an effluent that will not impact the environment and for human wellbeing concerning the assurance of the biological system. The utilization of the bacteria speeds up the way toward treating contamination on a little surface. The measure of poisons delivered today is too high to even consider holding the regular cycle back from evolving. In this manner, sewage treatment plants can forestall eutrophication of waterways, for instance forestalls the dissemination of infections [2]. Sewage is composed of organic matter such as carbohydrates fats, oil, grease and proteins mainly from domestic waste. It also contain dissolved inorganic matter such as nitrogen and phosphorous mainly

from agricultural wastes. It is essential to remove the nutrients before they are released to environment because it will interfere natural habitats both directly and indirectly [3]. The microbes such as *Bacillus pumilus* *Brevibacterium sp*, *Pseudomonas aeruginosa*, *Chromobacter*, *Flavobacterium*, consume the major part of the organic matter in the effluent. The microbes present in wastewater will reduce the BOD (biological oxygen demand). Biological treatments by bacteria, nematodes or other small organisms breaks down organic wastes using normal cellular processes [4]. The microbes beneficial for nitrogen removal are *Nitrosomonas europaea* and *nitrobacter hamburgesis*, whereas the sulphate removal bacteria are *Desulfotomaculum* and *Desulfovibrio*.

Table 1: Microorganisms and their role in sewage treatment

NAME OF BACTERIA	SEWAGE TREATMENT	REFERENCE
<i>Bacillus Subtilis</i>	Quinoline removal	[1]
<i>Rhodobacter</i>	Clean waste	[2]
<i>Algae</i>	Coliform bacteria removal	[3]
<i>Protoza</i>	Improving the quality of effluent	[4]
<i>Pseudomons spp</i>	Heavy metal chelation, Antibiotics	[4]

Biological wastewater treatment: Wastewater treatment by the microbes is the most well-known strategy continued in the entire world. Different microorganisms are utilized for the treatment and cleansing of water that is contaminated. Wastewater treatment is a fundamental advance for human wellbeing and for the security of the climate as well. These microscopic

organisms speed up the treatment of contamination on a limited scale surface. The wastewater treatment plant is superior for allowing the waterway to deal with it, on the grounds that despite the fact that it's a similar purging interaction that happens in nature, the amounts of contamination released today are too high to even think about keeping the regular cycle flawless. In

this manner, sewage treatment plants can forestall eutrophication of waterways, yet in addition forestalls the dissemination of illnesses.

BOD in wastewater treatment:

BOD is the chemical procedure for determining the amount of dissolved oxygen needed by aerobic biological organism. Bio-bugs that are present in water body are required to breakdown the organic material that is present in sewage sample. This technique is used to measure dissolved oxygen that is used by microorganisms. Biochemical oxygen demand / biological oxygen demand is an important water quality parameter because it provides an index to assess the effect discharged wastewater will have on the receiving environment. The higher the BOD value, the greater the amount of organic matter or “food” available for oxygen consuming bacteria. If the rate of Dissolved oxygen (DO) consumption by bacteria exceeds the supply of DO from aquatic plants, algae photosynthesis or diffusing from air, unfavourable conditions occur. Depletion of DO causes stress on aquatic organisms, making the environment unsuitable for life. Further, dramatic depletion can lead to hypoxia or anoxic environments. BOD is also used extensively for wastewater treatment, as decomposition of organic waste by

microorganisms is commonly used for treatment.

Wastewater treatment using microalgae:

Microalgae consume a significant part in treatment of waste in the auxiliary treatment cycle. Algae are significant organism for biological treatment of purification of wastewater because they can accumulate plant nutrient, heavy metals and pesticides, organic and inorganic toxic substance. For example, the expulsion of nitrogen and phosphorus, coliform microbes, heavy metals and decrease of biochemical oxygen demand, it can likewise create biomass that can be a huge wellspring of natural manures. Algae can act as bio filter for nutrient laden, CO₂ laden can convert low oxygen water in highly rich oxygen water [5]. Large number of organic and inorganic substances disturb the water quality, which are the main causes of eutrophication of the water body. They also proved to be powerful stimulants to algal growth and consequently formation of “algal blooms”. Algal blooms can affect the water quality in several ways. Algae such as *Chlorella*, *Scenedesmus*, *Euglena*, *Chlamydomonas* are commonly used for wastewater treatment [6].

Wastewater Treatment Using Membrane Bioreactor

Membrane bioreactor (MBR) combines membranes with biological processes for treatment of wastewater. MBR provides

high quality of treated water with complete solid removal and disinfection capability, combined with high rate and efficiency of organic and nutrient removal in one unit, small foot print low or near zero sludge production, high loading rate capability, rapid start up, modular and retrofit. It is free from sludge bulking problem thus, has high performance and low maintenance [7]. Membrane bioreactor can produce high quality effluent that is appropriate for unlimited industrial and irrigation applications especially prospective for use in developing countries where there is need for improved sanitation [8]. One of the growing application of MBR is pre-treatment of wastewater by reverse Osmosis that is followed by Ultra Violet radiation that can produce water for direct or indirect potable use [9].

Wastewater Treatment using Constructed Wetlands

Constructed wetland is an organic wastewater treatment system that mimics and improves the effectiveness of the processes that help to purify water similar to naturally occurring wetlands. The system uses water, aquatic plants (reeds, duckweed), naturally occurring microorganisms and a filter bed (usually of sand, soils and/or gravel). Constructed wetlands can be used for either secondary or tertiary wastewater treatment. Constructed wetland are of low cost and are

easily operated, maintained and have a strong potential for application in developing countries [10]. There have been a several reports for fecal *Coliform* and Pathogen removal in wetland and different formats [11]. However removal of *Vibrio cholera* was as slow as removal of the indicators. In India, constructed wetland System is still on an experimental scale, treating different kinds Wastewater [12]. One of the major restraints of wetlands System is the requirement of a large land and that is not readily available in developing countries such as India.

DISCUSSION

This analysis was carried out for the treatment of wastewater with microorganisms. Biodegradation of wastewater is beneficial for environment, for recycling the waste water which can be used for agriculture. Microbes helps in degradation of the heavy metal as well as controls the pollution. Most of microbes play very important role in sewage treatment by utilizing the method such as BOD (biological oxygen demand) that break down organic material which are present in sewage waste. This includes sewage treatment using microalgae, bioreactors and wet land treatment to measure the strong oxidant under the acidic conditions using the titration method. All these play most important role in wastewater treatment.

CONCLUSION

This study is analysis of transforming the materials available in the wastewater into secure end -products that are safely disposed of into domestic water devoid of any negative environmental effects. Farmers for crop irrigation use the sewage water that is treated by microbes. The sewage water may consist of diseasecausing bacteria and protozoan that may pose a health risk to farmers and local population. In this study, we try to analyse all the low cost technology used for degradation of all the potent pollutants of wastewater. The wastewater that is obtained from our daily activities and from industries must be treated with the help of microorganism to reduce pollution. Algae are significant organism for biological treatment of purification of wastewater because they can accumulate plant nutrient, heavy metals and pesticides, organic and inorganic toxic substance.

REFERENCES

- [1] Zhao, H., Duan, X., Stewart, B., You, B., & Jiang, X. (2013). Spatial correlations between urbanization and river water pollution in the heavily polluted area of Taihu Lake Basin, China. *Journal of Geographical Sciences*, 23(4), 735-752.
- [2] Hesnawi, R., Dahmani, K., Al-Swayah, A., Mohamed, S., &

- Mohammed, S. A. (2014). Biodegradation of municipal wastewater with local and commercial bacteria. *Procedia Engineering*, 70, 810-814.
- [3] Painter, H. A., & Viney, M. (1959). Composition of a domestic sewage. *Journal of Biochemical and Microbiological Technology and Engineering*, 1(2), 143-162.
- [4] Samer, M. (Ed.). (2015). *Wastewater treatment engineering*. BoD—Books on Demand.
- [5] Deviram, G. V. N. S., Pradeep, K. V., & Prasuna, R. G. (2011). Purification of waste water using Algal species. *European Journal of Experimental Biology*, 1(3), 216-222.
- [6] Judd, S. (2006). *The MBR book (2006) Principles and applications of membrane bioreactors in water and wastewater treatment*.
- [7] Daiger, G. T Rittmann B. E Andreottola, G (2005) Are membrane bioreactors ready widespread application? *Environ.Sci.Technol.* 39, 399-406
- [8] Shannon, M. A., Bohn, P. W., Elimelech, M., Georgiadis, J. G., Marinas, B. J., & Mayes, A. M. (2010). Science and technology for water purification in the coming decades. *Nanoscience and*

technology: a collection of reviews from nature Journals, 337-346.

- [9] Kivaisi, A. K. (2001). The potential for constructed wetlands for wastewater treatment and reuse in developing countries: a review. *Ecological engineering*, 16(4), 545-560.
- [10] Juwarkar, A. S., Oke, B., Juwarkar, A., & Patnaik, S. M. (1995). Domestic wastewater treatment through constructed wetland in India. *Water Science and Technology*, 32(3), 291-294.
- [11] Torkian, A., Egbali, A., & Hashemian, S. J. (2003). The effect of organic loading rate on the performance of UASB reactor treating slaughterhouse effluent. *Resources, Conservation and Recycling*, 40(1), 1-11.
- [12] Sikosana, M. L., Sikhwivhilu, K., Moutloali, R., & Madyira, D. M. (2019). Municipal wastewater treatment technologies: A review. *Procedia Manufacturing*, 35, 1018-1024.