ISSN: 0975-833X

Available online at http://www.journalcra.com

International Journal of Current Research
Vol. 7, Issue, 07, pp.17670-17673, July, 2015

INTERNATIONAL JOURNAL OF CURRENT RESEARCH

RESEARCH ARTICLE

ISOLATION OF PSEUDOMONAS STRAIN FROM COW DUNG AND USED TO TREAT THE SOLAR ASSISTED LOW-COST SYSTEM WASTE WATER

*Somnath De, Sanjib Rana and Sagarika Banerjee

Department of Biotechnology, Panskura Banamali College, West- Bengal, India

ARTICLE INFO

Article History:
Received 22nd April, 2015
Received in revised form
07th May, 2015
Accepted 09th June, 2015
Published online 28th July, 2015

Key words:
Waste water,
Pseudomonas sp.,
Solar water heater,
Reduce the impurities of water.

ABSTRACT

Experimental studies have been carried out to develop a low cost system of waste water treatment. The system uses, besides a solar water heater, cheap easily available materials like lime sand, gravels, straw and charcoal. It removes solid materials, color and odors-producing materials, and water borne pathogens from waste water and make it suitable in different purposes. Here, we also isolate a Pseudomonas strain from cow dung and it is also used to treat the different impurities of waste water.

Citation: Somnath De, Sanjib Rana and Sagarika Banerjee, 2015. "Isolation of pseudomonas strain from Cow Dung and used to treat the solar assisted Low-Cost system waste water", *International Journal of Current Research,* 7, (7), 17670-17673.

INTRODUCTION

The treatment of waste water is required to upgrade the quality of water, so that it became suitable for its intended use. Boiling is usually prescribed to purify water, though it may not sever the purpose fully at times. However, by treating waste water with lime and then passing it through the filter beds, it is possible to removes organic matter and in organic substance, suspended materials, color and odors producing substances, and some of the harmful bacteria and other pathogen (Master, 1994). All pathogen are destroyed in water at 60^0C in 30 minutes. It can be done by using simple solar water heaters (Rabbni, 1985). Thus, the solar water purification appear to be a practical proposition (Martins, 1985). In this project work, an attempt has been made to present the performance of a low cost system, with an optional auxiliary heater, for waste treatment using bacteria (*Pseudomonas sp.*), solar energy and locally-available cheap materials. Safe diarrheal microorganism free drinking water and can be stored in clean containers for further use. One family, may harvests 10 liters in a clear sunny day (9 AM to 3 PM), which is enough for a family (Rabbani, 2012).

Corresponding author: Somnath De,
Department of Biotechnology, Panskura Banamali College, West-Bengal, India.

Commercial coagulants used for treating turbid or cloudy water by pulling together floating particles—including dirt, other solids, and some pathogens. These compounds are cheap, readily available and naturally biodegradable, reported that *Moringa*-seed powder alone has strong coagulant and antimicrobial effect at low doses (Zaman *et al*., 2012). The removal and the behavior of organic compounds during RBF depends on factors specific to pollutants such as the hydrophobicity of the compound, the potential for biochemical degradation, the amount of organic matter in the aquifer, microbial activity, infiltration rate, biodegradability, etc. Riverbank filtration technology has been a common practice in Europe for over 100 years, particularly in countries such as Switzerland where 80% of drinking water comes from RBF wells, 50% in France, 48% in Finland, 40% in Hungary, 16% in Germany, and 7% in the Netherlands (Tufenkji *et al*., 2002). In Germany, for example, 75% of the city of Berlin depends on RBF, whereas in Düsseldorf RBF has been used since 1870 as the main drinking water supply (Schubert, 2002). In the United States, on the other hand, this technique has been used for nearly half a century, especially in the states of Ohio, Kentucky, Indiana, Illinois, among others (Ray *et al*., 2002). Other countries that have recently started implementing RBF for drinking water supply are India (Sandhu *et al*., 2010), China, and South Korea (Ray, 2008).

MATERIALS AND METHODS

Isolation of Bacteria (Pseudomonas sp.)

At first we isolate bacteria (*Pseudomonas sp.)* from cow dung in specific media (Kings media) through serial dilution method. Then we transferred the bacteria in Kings media to get broth culture of *Pseudomonas sp.*

Settling Tank

The settling tank is ordinary plastic container, which is used to treat water with bacteria (*Pseudomonas sp.)* and then to supply treated water through filter beds. Here we stagnant the sample for 2 days with bacterial treatment. It can settle down impurities contain in waste water. The tank is also used to store waste water for the treatment

Primary Filter

The primary filter consists of an earthen ware with many small holes at the bottom, and filter beds made of a piece of cloth, gravels, and sand layer. This part removes impurities like suspended materials and a few pathogens from waste water (APHA. 1991).

Secondary Filter

The secondary filter consists of an earthen pitcher with many small holes at the bottom of Pitcher, and a filter bed made on straw and charcoal. It helps to removes color, oil particles and a few pathogens (Dutta and Rao, 1970).

Collection Tank

It is also an ordinary plastic container with stop cock. After secondary treatment, the water is collected in this tank and transferred to solar water heater through stop cock.

Solar Water Heater

Solar Water Heater consists of a plastic jar placed inside an insulated metallic tray covered with transparent polythene. The function of this part is to heat the filtered water using solar radiation to removes water borne pathogens and produce purified water. The plastic jar is painted on black on three sides, and the paint free side is used as a window of solar radiation. Laboratory studies have demonstrated the effects of key operational parameters such as light intensity and wavelength, solar exposure time, availability of oxygen, turbidity, and temperature (Berney *et al*., 2006 and Reed, 2004).

Storage Tank with Auxiliary Heater

This unit is optimal. It can be used be cloudy and rainy days when solar water heater will not be able to heat the water to desired temperatures. It can also be used to boil purified water to produce high quality drinking water.

Test Samples and Experiments

To study the performance of the system, experiments and tests have been conducted using three samples, of 4 liter each of waste water named as Sample-I, Sample-II Sample-III.

Sample-I is collected from village pond (Panskura, West Bengal, India). Sample-II is collected from river (Kangsabati, Panskura, West Bengal, India). Sample III is collected from paper mill effluents (Ghoraghata, Howrah, West Bengal, India).

Various Experiments and tests have been carried out for each of these three samples before and after the treatment of this process to study the impurity-removal capacity of system. To find the P^H, chemical oxygen demand (COD), biochemical oxygen demand (BOD), total solids, suspended solids, and pathogen content of the sample before and after the treatment and also study the rise in filtered-water temperature in the solar water heater.

RESULTS AND DISCUSSION

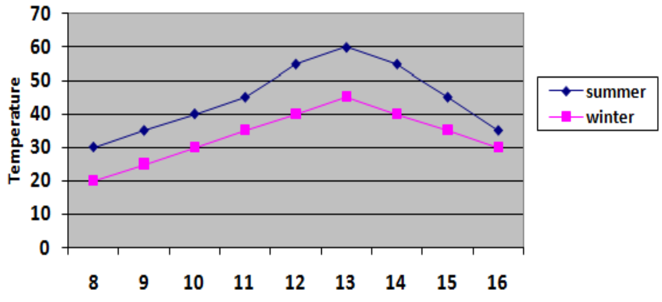
The results obtained from the experiments and tests conducted for the three samples of the water and shown in the Table 1 & Table 2.

Table 1. Analysis of waste water samples before treatments

Component	Sample-I (Pond)	Sample-II (River)	Sample-III (Paper mill waste water)
Color	Slightly greenish	Turbid	Slightly yellow
Odor	Bad	No	Slightly bad
BOD	150mg/lit	205 mg/lit	100 mg/lit
COD	9.2 mg/lit	24.4 mg/lit	30.5 mg/lit
Total solids	649 mg/lit	160 mg/lit	6040 mg/lit
P^H	7.8	6	8.6
Salinity	2	0.5	8.5
Pathogens	(10^{-4})-24 Colonies	(10^{-4})-37 Colonies	(10^{-4})-14 Colonies

Table 2. Analysis of waste water sample after treatment

Component	Sample-I (Pond)	Sample-II (River)	Sample-III (Paper mill waste water)
Color	Colorless	Colorless	Colorless
Odor	No	No	No
BOD	39 mg/lit	50 mg/lit	33 mg/lit
COD	708 mg/lit	8.4 mg/lit	10.4 mg/lit
Total solids	600 mg/lit	150 mg/lit	3050 mg/lit
P^H	8	6.8	9.2
Salinity	1.5	0	7.5
Pathogens	(10^{-4})-10 Colonies	(10^{-4})-14 Colonies	(10^{-4})-7 Colonies



Amount of water=1litre

Figure 1. Performance of low cost solar water heater

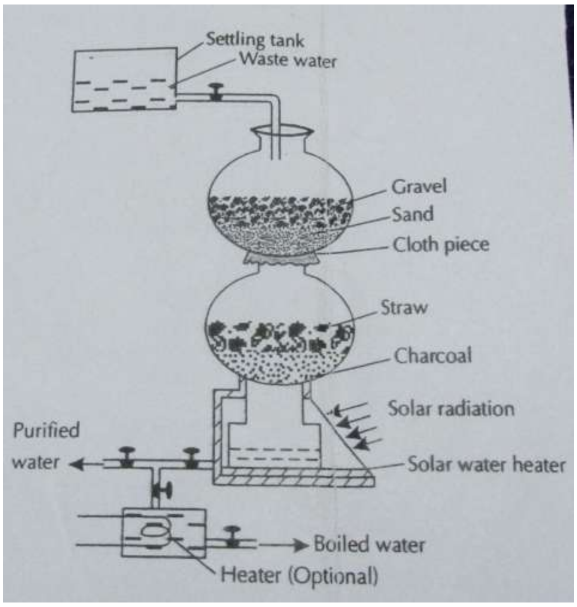


Figure 2. A novel model of Solar-assisted waste water treatment system

From these results it can be seen that the system developed for waste water treatment can be used to removes a variety of impurities to produce purified water. The biocide action of UVA has also been attributed to the production of reactive oxygen species (ROS) which are generated from dissolved oxygen in water (Khaengraeng and Reed, 2005). In the settling tank the waste water is treated with lime (5g/L) and bacteria to remove turbidity, organic, inorganic substances, color, odor, and taste-producing substances. In this way we can also reduce the level of harmful bacteria and other pathogens. The materials settled at the bottom of the tank are obtained as secondary pollutants which can be removed by washing and cleaning the tanks frequently after treatment. The filtered beds of primary filter can be removed suspended materials (liquid/solid), and few pathogens. The filter beds of secondary filter can remove the color of water and oils particles the most of the pathogen (90%). The color is removed by charcoal and oils particles and absorbed by straw. The water coming out through the filter beds contains a few pathogens and very small amount of dissolved solids. The pathogens are destroyed by heating water at 60^0C for 30 minutes in solar water heater. Figure 1 shows the variation of water temperature in the solar water heater with the hours of the day in winter it rise the water temperature to a maximum of 62 ^{0}C to destroy pathogens. Since the maximum water temperature of 73 ^{0}C can be attain in summer using the above system, the process of water purification is faster. The auxiliary heater can be used on cloudy/rainy days. Figure 2 also represent an innovative model of solar-assisted waste water system.

Conclusion

In these experiments the cost of system is low as the materials are used and a large amount of organic materials are removed from this waste water. For the treatment of industrial waste water, certain modifications in the system design and advance treatment processes are required. On cloudy and rainy days, the solar water heating system is used in the study cannot heat the water adequate temperature; the system can remove mainly water borne pathogens, and cannot remove other high temperature resistant pathogens. An auxiliary heater can be used to solve this problem. By this innovative novel approach we can reduce the impurities of waste water in different industrial sector to prevent the rate of pollution in environment.

REFERENCES

APHA. 1991. *Standered Method for Examination of water and waste water,* pp.535-538. Washington. DC: America Public Association.

Berney, H. U., Weilenmann, A., Simonetti, A., Egli, T., 2006. Efficacy of Solar Disinfection of *Escherichia coli*, *Shigella flexneri*, *Salmonella typhimurium* and *Vibrio cholerae*, *Journal of Applied Microbiology*. 101: 828-836.

Dutta, A.K., Rao, M.N. 1970. *Waste water treatment*, pp.301-303. New Delhi: IBH Ltd.

Khaengraeng, R., Reed, R. H. 2005. Oxygen and Photo-Inactivation of *Escherichia coli* in UVA and Sunlight, *Journal of Applied Microbiology*. 99: 39-50.

Martins, H. 1985. *Modern Bacteriology,* pp.168-170. England. J&A Churchill Ltd.

Master, G.M. 1994. *Introduction to Environmental Engineering and Science*, pp.229-231. New Delhi: Prentice Hall of India Pvt. Ltd.

Rabbani, K.S. 2012. *Low Cost Domestic Scale Technologies for Safe Drinking Water*, Appropriate Healthcare Technologies for Developing Countries.

Rabbni, K.S. 1985. Elimination of Diarrheal Pathogens from drinking water Using Low cost Solar Device, *Proceedings of the International Conference on Physics and Energy for Development,* pp.317-322. Dhaka: East Bengal Publishing Co. Ltd.

Ray, C., 2008. Worldwide Potential of Riverbank Filtration, *Clean Technologies and Environmental Policy*. 10: 223-225.

Ray, C., Grischek, T., Schubert, J., Wang, J. Z., Speth, T. F. 2002. A Perspective of Riverbank Filtration., *Journal of American Water Works Association* (*AWWA*).94: 149-160.

Reed, R. H., 2004. The Inactivation of Microbes by Sunlight: Solar Disinfection as A Water Treatment Process, *Advances in Applied Microbiology*. 54: 333- 365.

Sandhu, C., Grischek, T., Kumar, P., Ray, C. 2010. Potential for Riverbank Filtration in India," *Clean Technologies and Environmental Policy*. 13: 1-22.

Schubert, J. 2002. Hydraulic Aspects of Riverbank Filtration-Field Studies, *Journal of Hydrology*. 266: 145-161.

Tufenkji, N., Ryan, J. N. and Elimelech, M. 2002. The Promise of Bank Filtration., *Environmental Science and Technology.* 36: 422-428.

Zaman, S., Sultana, S., Begum, A., Akhter, M.Z., Yeasmin, S., 2012. Effectiveness of Moringa Seed Powder, Scal-lop Powder and Other Commercial Powders in the Purify- cation of Pond Water, *Proceedings of Asian Food Safety and Security Association*, 1(1), pp. 103- 106.

****