ISSN: 0976-3031

Available Online at http://www.recentscientific.com

CODEN: IJRSFP (USA)

International Journal of Recent Scientific Research
Vol. 8, Issue, 6, pp. 17888-17891, June, 2017

International Journal of Recent Scientific Research

DOI: 10.24327/IJRSR

Research Article

PHYSICO CHEMICAL PARAMETERS OF UNTREATED INDUSTRIAL EFFLUENT AND ITS EFFECT ON GERMINATION AND GROWTH OF PLANT, LUCERNE GRASS- *ALFAALFA*

Noorjahan C.M*

Department of Zoology, Justice Basheer Ahmed Sayeed College for Women (Autonomous), Chennai-600 018, Tamil Nadu, India

ARTICLE INFO

Article History:

Received 17th March, 2017
Received in revised form 12th April, 2017
Accepted 04th May, 2017
Published online 28th June, 2017

Key Words:

Untreated industrial effluent, physico chemical parameters, Lucerne grass-*Alfaalfa,* germination and growth.

ABSTRACT

Environmental pollution has now become a global problem which is mainly due to the discharge of various industrial wastes into the environment without proper treatment before its disposal by the industries. Hence the present study was carried out to determine the physico chemical parameters of untreated industrial effluent and also to study its effect on the germination and growth of plant, Lucerne grass-*Alfaalfa*. The results of physico chemical parameters of the effluent showed that the colour of the effluent was black with unpleasant odour, pH was alkaline with high pollution load such as EC, TSS, TDS, BOD, COD and chromium which surpassed the permissible limits for its disposal indicating high pollution potential of the effluent. The results of germination and growth of plant, Lucerne grass - *Alfalfa* revealed decreased rate of germination as well as the growth of plant which may be due to the presence of toxic substances present in waste water that has decreased the growth of Lucerne grass-*Alfalfa* exposed to 100% untreated sample.

INTRODUCTION

Water is one of the most important constituent of life supporting system (SangitaP.Ingole *et al.,* 2012). It is the basic requirement of all living beings. Hence all organisms have a right to access clean water. But humans, the most dominating creatures on earth exploit it. The increasing demand of luxurious utilities paves way to industrialization. Industrial growth not only offers a better lifestyle to human beings but also provides various opportunities to millions of people worldwide. But these industries release various harmful substances into the environment thereby polluting the surrounding and in turn it forms a threat to humanity itself.

Industrialization

There are various industries such as tannery, paper and pulp, sago, sugar, distillery etc. which contribute to environmental pollution. The industrial effluents pollute not only the water bodies but also the entire biosphere (SaravanaBabu, 2011). Tannery industry is reputed globally as a major industry, which contributes to water pollution, owing to the major consumers of water and usage of mineral tanning agents. (Devi, 2011). The Tannery effluent ranked as high pollutants among all other industrial waste (Eye and Lawrence, 1971). It is highly complex and toxic. Generally tannery waste water is basic, dark brown in colour and have high content of organic substances. These substances vary according to the chemicals used (Leta *et al.,* 2004). It contains tannin, high suspended solids and dissolved solids, BOD and some inorganic compounds such as chlorides, sulphides, sulphates, sodium and some toxic heavy metals, which affect the environment (Noorjahan, 2014).

Impact of industrial effluent on the environment

Industrial waste produce serious consequences of pollution on fresh water streams and lands for agriculture (Leta *et al.,* 2004). Tannery containing large amount of wastes especially tannins are toxic to plants, animals and soil as well as water microorganisms. They cause stunting growth, chlorosis and reduction in yield in plants (Subramani and Hari balaji, 2012). Heavy metals in the tannery effluent is one of the most hazardous environmental pollutants. Toxic heavy metals like Cr, Cu, Zn, Pb and Cd are mostly absorbed and get accumulated in various plant parts as free metals which may adversely affect the plant growth and metabolism. Human beings and cattles are affected when these metals are incorporated into the food chain (Iman Khasim and Nandakumar, 1989).

Based on all the above literature cited, an attempt has been made to analyze the Physico-chemical parameters of untreated

Corresponding author:* **Noorjahan C.M
Department of Zoology, Justice Basheer Ahmed Sayeed College for Women (Autonomous), Chennai-600 018, Tamil nadu, India

industrial effluent and to study its effect on the germination and growth of plant, Lucerne grass- *Alfaalfa*.

MATERIALS AND METHODS

Materials

Collection of Untreated Industrial (Tannery) Effluent

Untreated industrial effluent was used as the material in this study. The untreated sample was collected in polythene containers from the point where in the effluent from different processing units are discharged together from industry situated in Chennai, Tamil Nadu, India. They were brought to the laboratory with due care and stored at 25°C for further analysis.

Procurement of seeds of plant, Lucerne grass-Alfalfa, for germination and growth in 100% untreated industrial effluent

The seeds of plant, Lucerne grass-*Alfalfa* were procured from a local nursery located in Chennai for the germination and growth in 100% untreated industrial) effluent.

Methods

Physico-chemical parameters of untreated industrial effluent

The physico-chemical parameters such as Colour, Odour, pH, Electrical Conductivity (EC), Total Suspended Solids (TSS), Total Dissolved Solids (TDS), Biochemical Oxygen Demand (BOD), Chemical Oxygen Demand (COD) and heavy metals-Chromium of untreated industrial effluent were determined by following the Standard Methods outlined by APHA (1995).

Germination and growth of plant, Lucerne Grass, *Alfaalfa*
Germination and growth of plants such as Lucerne Grass-*Alfalfa* was carried out by following the procedure of Brightlin, (2012). The seeds of Lucerne Grass-*Alfalfa*, were washed with mercuric chloride solution for 2 minutes and then thoroughly washed in distilled water. Each earthen pot filled with farm yard manure was sown with 10 seeds allowed to germinate by irrigating with equal volume of untreated industrial effluent. One set was irrigated with water as control. Five replicates were maintained for each concentration. Experiment was carried out for the period of 90 days. The vegetative features (i.e) shoot length, root length, number of leaves and number of sub roots of the above plant were recorded on every 10^{th} day for a period of 90 days growth.

Statistical Analysis

The data obtained from the experiments was analysed and expressed as mean and standard deviation and Anova.

RESULTS AND DISCUSSION

Analysis of physicochemical parameters of untreated industrial effluent

Results of the analysis of the physico chemical parameters of untreated industrial effluent is depicted in Table-1. The results of the study revealed that colour of the untreated industrial effluent was blackish in colour with unpleasant odour. This colour and odour of the untreated effluent could be due to decomposition of organic or inorganic matter (Noorjahan, 2014). pH of the industrial effluent was found to be alkaline (7.27±0.0187), alkaline nature of the tannery effluent may be attributed to the presence of carbonates and bicarbonates present in the effluent (Kamu and Achi, 2011).

Table 1 Analysis of physico chemical characteristics of untreated industrial effluent ± Standard Deviation

S.No.	Physico chemical parameters	CPCB (1995)	Untreated industrial effluent
1	Colour	Colourless	Blackish
2	Odour	Odourless	Unpleasant
3	pH	5.5-9.0	7.27±0.0187
4	Electrical Conductivity (EC) (µmhos/cm)	400	8990±1.8708
5.	Total Suspended Solids (TSS)(mg/l)	100	6908±1.8708
6.	Total Dissolved Solids (TDS)(mg/l)	2100	6672±1.8748
7.	Biochemical Oxygen Demand (BOD) (mg/l)	30	1722±1.8906
8.	Chemical Oxygen Demand (COD) (mg/l)	250	9600±2.908
9.	Total Chromium (mg/l)	2	44.5±0.1870

Electrical conductivity of the sample was high (8990±1.8708), which may bedue to the presence of inorganic substances and salts (Ivy *et.al.,* 2015). According to Saxena and Shrisvastava (2002), the level of total suspended solids was found to be higher (6908±1.8708), in industrial effluent, compared to CPCB (1995) permissible limit for effluent discharge. This high amount of suspended particles has adverse effects on aquatic organisms, reduced the diversity of life in aquatic system, depletes oxygen and cause silting in ponds during rainy season (Brightlin, 2012). High level of TDS (6672±1.8748), in the effluent may be due to high salt content and also renders it unsuitable for irrigation (Ivy *et.al.,* 2015). BOD level was also high (1722±1.8906), than the permissible limits of CPCB (1995). COD test is the best method for organic matter estimation and rapid test for determination of total oxygen demand by organic matter present in the sample, whereas elevated amount of COD (9600±2.908) in the present study may be due to high amount of organic compounds which are not affected by the bacterial decomposition. (Nagarajan and Sasikumar, 2002) and resulted in decreased dissolved oxygen in the aquatic ecosystem this indicate that the effluent is unsuitable for the existence of aquatic organisms due to the reduction in DO content (Goel, 1997). Chromium levelwas higher (44.5±0.1870) than the permissible limit of CPCB (1995). Thus the analysis of physicochemical parameters of untreated industrial effluent confirms that the effluent released from the industry was black in colour with unpleasant odour, pH was alkaline with high pollution load such as EC, TSS, TDS, BOD, COD and chromium which surpassed the permissible limits of CPCB (1995) for its disposal indicating high pollution potential of the effluent. Germination and growth of plant, Lucerne Grass-*Alfaalfa* Organic nutrient content of domestic wastes can be considered for the agriculture purpose. Hence the present study was extended further to study the effect of 100% untreated industrial sample on germination and growth of plant, Lucerne grass, *Alfalfa* for a period of 90 days. The results of germination and growth of plant, Lucerne grass-*Alfalfa* recorded on $10^{th,}$ $20^{th,}$ 30^{th} $40^{th,}$ 50^{th}, 60^{th}, 70^{th}, 80^{th} and 90^{th} day for a period of 90 days and morphological features such as their shoot length, root length, number of sub roots and number of leaves are depicted in Table- 2.

Table 2 Germination and Growth of plant, Lucerne grass - *Alfalfa* using untreated industrial effluent for a period of 90 days

Parameters	Samples	10th Day	20th Day	30th Day	40th Day	50th Day	60th Day	70th Day	80th Day	90th Day
Number of Leaves	Control	3	7± 1 *	8±1 *	9±1 *	10±1 *	11±1 *	11±1 *	11±1 *	11±1 *
	Untreated effluent	3	6±1 *	8± 1*	9±1 *	9±1 *	9±1 *	10±1 *	10±1 *	10±1 *
Root Length	Control	2.5±0.2*	2.5±0.2 *	3.2± 0.2 *	3.9±0.2 *	4.2±0.2 *	4.8±0.2 *	5±0.2 *	5.2±0.2 *	5.8±0.2 *
	Untreated effluent	1.5±0.2*	2.1±0.2 *	3±0.2 *	3.5±0.2 *	3.8±0.2 *	4.2±0.2 *	4.3±0.2 *	4.5±0.2 *	4.7±0.2 *
Shoot Length	Control	2	3.3±0.2*	4.5±0.2 *	5.5±0.2 *	5.9±0.2 *	6.2± 0.2 *	6.8±0.2 *	7±1 *	7.2± 0.2 *
	Untreated effluent	1.1±0.2*	1.5±0.1 *	4.3±0.2 *	5.5±0.2 *	5.6±0.2 *	6.1±0.2 *	6.4± 0.2 *	6.8±0.2 *	6.9± 0.2 *
Number of Sub Roots	Control	1.9±0.86445	6	8± *	9	9	11	12	12	12
	Untreated effluent	1	3.85± 2.04917 *	5.075±2.01274 *	6.25±2.19317 *	6.1±2.04584 *	6.825±2.0168 *	7.675±2.62233 *	7.825±2.50204 *	7.9±1*

* Statistically significant at 0.05% level.

The results of the study revealed that decreased rate of germination as well as the growth of plants were recorded on exposure to untreated effluent when compared to control. On 10th day, the number of leaves was recorded as 3 in control plant and also in plant exposed to untreated sample. But on 90th day, the number of leaves was reduced to 10±1* in plant exposed to untreated sample than that in control (11±1*). On the 10th day, the root length of plants in control was 2.5±0.2* but it was reduced in plants exposed to untreated sample (1.5±0.2*). On 90th day, the root length of plants exposed to untreated sample was 4.7±0.2* than that of control plant (5.8 ±0.2*). On 10th day, the shoot length was recorded as 2 in control plant but the shoot length in plants exposed to untreated sample was reduced to 1.1±0.2* . But on 90th day, the shoot length was reduced to 6.9±0.2* in plant exposed to untreated sample than that in control (7.2±±0.2*). On 10th day, the number of subroots was recorded as 1.9±0.86445 in control plant whereas in plants treated with untreared sample, number of subroots was reduced to 1. But on 90th day, the number of subroots was reduced to 7.9±1* in plant exposed to untreated sample than that in control (12). The presence of toxic substances present in waste water has decreased the growth of Lucerne grass-*Alfalfa* exposed to 100% untreated sample when compared to control (Tap water). This work is in agreement with the results of Imenpek *et.al.,* (2017) and Noorjahan and Sheeba Ali Siddiqui, (2017). The data are statistically significant at 0.05% level.

CONCLUSION

Hence from the overall results of the above study, it can be concluded that untreated industrial effluent was black in colour with offensive odour. pH was alkaline with high organic load such as EC, TSS, TDS, BOD and COD which were higher than the permissible limits of CPCB (1995), indicating high pollutional load of the effluent which has to be treated before its release into the environment. Further germination, and growth rate of the plant, Lucerne grass was reduced when exposed to untreated industrial effluent due to the presence of toxic pollutants present in the effluent

Acknowledgement

I am very grateful to University Grants Commission for the financial support rendered for the completion of this project sanctioned under XI plan guidelines.

References

Anuradha Sharma and PiyushMalaviya. 2016. Irrigational impact of untreated and treated brewery-distillery effluent on seed germination of Marigold (*Tageteserecta* L.) *JEB., 37:115-119.*

APHA. 1995. Standard methods for the examination of water and wastewater. American Public Health Association, Washington, DC. 17thed.

Brightlin, C. 2012. Physico-chemical characteristics, isolation of fungi, degradation of tannery effluent using native and non-native fungus, reuse of biotreated water for germination, growth and biochemical estimation of ornamental plant, *Impatiens balsamina* B.Sc. Dissertation, University of Madras.

CPCB. 1995. Pollution control, acts, rules and modifications issued their under Central Pollution Control Board, New Delhi.

Devi, R. 2011. Bioremediation of tannery effluent by *Aspergillus flavus.Poll. Res., 6(4): 141- 148.*

Eye J.D and Lawrance, L. 1971. Treatment of waste from sole leather tannery. *J. Wat. Pollut. Cont. fed*., *43:2291-2303*

Goel, P.K. 1997. Water pollution, causes, effects and control. New Age International (P) Ltd., publishers, New Delhi, 269.

Iman Khasim and Nandakumar, N.V. 1989. Environmental Contamination of chromium in agricultural and animal products near chromate industry. *Bull.Environ. Contam. Toxicol., 43: 742-746.*

Imen Rekik, ZaynabChaanbane, Amara Missaoui, Ali Chenon Bouker, Lenka Luptak, Ameena Elleuchi and Lassaad Brillashni. 2017. Effects of untreated and treated wastewater at the morphological, physiological and biochemical levels on seed germination and development of sorghum (*Sorghum bicolor* (L.) Moench). Alfaalfa (*Medicago sativa* L.) and Fescue (*Festucaarundinacea* Schreb.). *Journal of Hazardous Materials*, *326: 165-176.*

Ivy, N., Hossain, M. K. and Md. Hossain, L. 2015. Effects of industrial effluents on germination and early growth of selected agricltural crops. *Journal of Agronomy*, *14: 43-48.*

Kanu. I. and Achi, O.K. 2011. Industrial effluents and their impact on water quality of receiving rivers in Nigeria. *J. Applied Technol. Environ. Sanitation, 1: 75-86.*

Leta, S., Assefa, F., Gumaelius,. L. and Dalhammar, G. 2004. Biological nitrogen and organic matter removal from tannery wastewater in pilot operations in Ethiopia. *Applied Microbial. Biotechnolog*y, *66: 333-339.*

Nagarajan, K, and Sasikumar, R. 2002. Effect of sago effluent on selected physiological aspects of the fresh water fish, *Labeorohita*., *J. Ecotoxicol. Environ. Monit., 12(3) : 233-238.*

Noorjahan, C. M. 2014. Physicochemical characteristics, identification of fungi and biodegradation of industrial effluent. *Journal of Environment and Earth Science,4: 2224-3214.*

Noorjahan, C.M. 2015. Physicochemical parameters and toxicity of industrial treated effluent on the germination and growth of vegetable. *IJSETR, 30(4): 5804- 5806.*

Noorjahan, C.M. and Sheeba Ali Siddiqui. 2017. Biotreatment of flavour effluent and its reuse for growth of ornamental plant *Chrysanthemum* sp. *International Journal of Science and Research, 6(1): 11-14.*

SangitaP. Ingole, Aruna, U. Kalde and Maggirwar,R. C. 2012. Biodegradion of tannery effluent by using tannery effluent isolate. *International Multidisciplinary Research Journal. 2(3): 43-44.*

SaravanaBabu. S. 2011. Treatability studies of tannery effluent by bacteria. *Indian Stream Research Journal-1(4): 25 -30*

Saxena, S. and Shrivastava, P. 2002. Ground water quality of a typical urban settlement. *Pollution Research, 21:223-226.*

Subramani, T. D.and Haribalaji. 2012. Biodegradation of tannery effluent and designing the reactor for clarifier and activated sludge process. *IJMER., 2(3): 774-781.*

How to cite this article:

Noorjahan C.M., Physico Chemical Parameters of Untreated Industrial Effluent and its Effect on Germination and Growth of Plant, Lucerne Grass-Alfaalfa. *Int J Recent Sci Res.* 8(6), pp. 17888-17891.

****