ISSN: 0975-8585

Research Journal of Pharmaceutical, Biological and Chemical Sciences

An Investigation To Eco-Friendly Manufacturing: A Study On Physicochemical Characterization And Quantitative Estimation Of Heavy Metals In Textile Industry Effluents.

KY Karuna[1], Gopala Krishna Devisetty[2]*, and Ch. Kethani Devi[3].

[1]Assistant professor, Government Degree College, Agraharam, Satavahana University, Telangana, India.
[2]University of Technology and Applied Sciences, Department of Applied Sciences and Pharmacy, Chemistry Section, Muscat, Sultanate of Oman,
[3]Narasaraopeta Institute of Pharmaceutical Sciences (NIPS), Andhra Pradesh, India.

ABSTARCT

The textile industry is the main source of environmental pollution in terms of quality and quantity. Improper disposal of textile wastewater will cause serious environmental problems due to the presence of heavy metals in the waste which will adversely affect aquatic organisms. In the present study an attempt was made to assess physicochemical characteristics and heavy metal concentrations in samples of textile industry effluents. Large amounts of untreated wastewater are mostly produced by the textile industry, which increases water contamination and the spread of diseases to humans. The goal of the current study is to determine the heavy metal load that the textile sector places on natural wastewater streams by gathering and characterizing wastewater from the industry. Heavy metals and the primary pollution indicator factors were examined. The estimated parameters were contrasted with the CPCB & Bureau of Indian Standards specified standard values.

Keywords: Physicochemical characterization, Heavy metals**.** Textile industry, Effluents

https://doi.org/10.33887/rjpbcs/2025.16.1.8

Corresponding author

ISSN: 0975-8585

INTRODUCTION

The need for clothes and apparel rises along with the global population due to evolving fashion and lifestyle trends, and textiles are produced to keep up with demand. The manufacture of textiles has become a major source of revenue for various nations, such India, Sri Lanka, Bangladesh and Pakistan and it boosts their GDP. On the other hand, this had both positive and negative effects on these nations, with the former being attributed to increased environmental degradation and the latter to economic growth [1-4].

MATERIALS AND METHODS

Various Techniques were used to analyse effluent samples. Colorimeter was used to determine composition of Iron, Flame emission spectrophotometer was used to determine the composition of Sodium & Potassium, UV-Visible spectrophotometer was used determined Calcium and finally Copper, Zinc and Nickel and Heavy metals (Pb, Cd & Hg) were determined by using Atomic Absorption Spectrophotometer.

Physicochemical Analysis of Textile Effluents

Physicochemical analyses of textile effluents were performed to evaluate some major parameters including pH, temperature (T), electric conductivity (EC), total suspended solids (TSSs), total dissolved solids (TDSs), chemical oxygen demand (COD), biological oxygen demand during 5 days at 20°C (BOD_5), P-phosphates (P-), and N-nitrites.

Collection of samples

Soil samples were collected freshly in sterile containers from Sircilla District, Telangana state.

Study area

Siricilla is a town and the district headquarters of Rajanna Siricilla district in the Indian state of Telangana. It is located on the banks of Manair river in the Siricilla mandal of Siricilla revenue division. It is popularly known as Textile Town due to the presence of large number of power looms, textile processing and dyeing units. It is the biggest textile hub in the state of Telangana with over 40,000 power looms. Siricilla, along with Warangal is proposed to be developed as a mega textile zone by the Telangana government. The first Visal Andhra Mahasabha in Telangana was held at Siricilla during the Visal Andhra movement.

RESULTS AND DISCUSSION

The collected samples were analysed for physicochemical characteristics, quantitative estimation of metals.

The results pertaining to various physicochemical characteristics of textile effluents are shown in Table 1. pH of different effluent samples appeared to lie between 9 to 11.

Table 1: Physicochemical characterization of effluent samples from various sites.

Physicochemical parameter	Sample-1	Sample-2	Sample-3
pH	10	9	11
TDS (ppm)	2102	1450	2452
TSS (ppm)	1534	1235	1835
COD (ppm)	725	675	778
BOD (ppm)	1050	895	1160
TA (ppm)	1128	1020	1159

The higher values of TDS and TSS are one of the major sources of domestic activities going on at that point.

ISSN: 0975-8585

Table 2: Inorganic elements present in effluent samples from various sites.

Inorganic elements (ppm)	Sample-1	Sample-2	Sample-3
Sodium	18	12	20
Sulphate	13	11	15
Phosphate	1.79	1.1	1.38
Chloride	1350	1286	1420

Table 3: Heavy Metal (mg/L) present in effluent samples from various sites.

Heavy Metal ion (ppm)	Sample-1	Sample-2	Sample-3
Ni	0.247	0.143	0.205
Fe	0.135	0.112	0.145
Cd	0.038	0.023	0.041
Cu	0.054	0.038	0.065
Cr	0.067	0.058	0.078
Zn	0.054	0.045	0.062
Pb	0.023	0.014	0.032

DISCUSSION

For choosing the most appropriate method for the determination of heavy metals present in or on textile material, different parameters should be considered. The most important are costs of the analyses, time required and number of samples available. Furthermore, limits of detection, sensitivity and selectivity of the method should be considered, as well as possible interferences caused by the sample matrix [5-11].

CONCLUSION

Current work concludes that the complex chemicals of textile effluents were characterized by the presence of various heavy metals. The purpose of the present study is to evaluate the potential effects of selected textile pollutants on aquatic ecosystem. The seed germination assay demonstrated that all tested effluents significantly affect the plant growth and development which was proved with reduction in chlorophyll content in seedling.

The current study has shown that textile industries of Siricilla region discharge effluents with high degree of alkalinity, COD, and BOD 5, TDS, TSS. It is therefore recommended that the effluent from the textile industry should be treated before being disposed of into the water bodies. Further investigation is required on the quality of textile effluent and its impacts on human livestock and agricultural health where it is used.

Obviously, people enjoy fashion, textile design, and related activities. Unfortunately, consumers buy and use finished textile items that consist of chemicals that are detrimental to human health, and after washing, those products have unavoidable harmful impacts on the environment. Almost all dyes used in the current manufacturing process of textile affect human skin and sometimes cause of eyes irritation. In addition, the chemicals used in the textile industry and its products become one of the sources of heavy metal that is harmful to our environment, and when those textile products are wore, they also could affect human body. This study indicate that the quality of textile finished products including cotton, polyester, polypropylene, and nylon were low in quality, but most importantly they have huge quantity of heavy metals. The use of chemicals with heavy metals in dying process should be minimized or completely stopped, and the related industries are encouraged to use natural dyes, which can be a mean in protecting human from heavy metal contamination as well as water resources.

Acknowledgements

Authors are very much tankful to the technical staff of the Government Degree College, Agraharam Department of Chemistry University of Technology and Applied sciences, Muscat (UTAS- Muscat), Sultanate of Oman for providing the necessary equipment and chemicals and to the benevolent management for providing the necessary infrastructural facilities.

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