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TEXTILE EFFLUENT – GENERATION, CHARACTERISTIC FEATURES AND IT'S BIODEGRADATION BY PLANTS

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ABSTRACT

Increasing globalization causes different environmental pollution. Out of pollution caused by various industries such as textile, dyeing and printing, paper, pulp, plastics, food, cosmetics and pharmaceuticals. Textile effluent causes one of the major environmental problems. The effluent from textile industries poses a threat to the environment, due to the presence of various pollutants like residues of different types of dyes, pigments, suspended solids and toxic chemicals. The effluent released from the textile industries are very difficult to treat, because of its complexity, wide variety of dye products such as dispersants, acids, bases, salts, detergents, oxidants, high BOD, COD, pH, colour and presence of heavy metal ions, chlorinated compounds. Different types of dyes used in the textile industry usually have a synthetic origin and complex aromatic molecular structures which make them more stable and more difficult to degrade. The complex textile effluent can be biodegraded by various plants (phyto remediation) reduce the complex pollutants into detoxified smaller compounds.

KEYWORDS: *Effluent, Degradation, Phyto-Remediation.*

INTRODUCTION

The process of converting raw fibers into finished apparel and non-apparel textile products comprises a diverse and fragmented group of establishments that produce textile related products (fiber, yarn and fabrics) for further processing into apparels [Allegre *et al*., 2006]. The water requirement for textile processing is large and varies, which depends on the factors like source of water and its availability, the quantity and quality of fabrics produced, types of processing and its sequence. For the production of one meter of finished cloth the water consumption is in the range of 12-65 liters. [Bharathi and Ramesh, 2013] [Kant, 2012]. The longer the processing sequence, the greater will be quantity of water consumed. The daily water consumption of an average of about 8000 kg of fabric is 1.6 million liters, in that 16 % consumed in dyeing and 8 % in printing. Specific water consumption for dyeing various from 30-50 l/kg of cloth depending on the type of dye used. Overall water consumption of yarn dyeing in about 60 liters / kg of yarn. [Brahmbhatt and Jasrai, 2016]

Textile Effluent Generation

Textiles generally go through three or four major stages of production that may include yarn formation, fabric formation, wet processing and textile fabrication [Brahmbhatt and Jasrai, 2016; Wang *et al*., 2011]. Effluent can be generated and released at various stages of textile processing with varying impurities are provided below (Table-1).

Table-1: Effluent Generation at various levels of Textile Processing.

Process	Waste water	Ref
Fiber preparation	Little or no wastewater generated, Fiber waste, packaging waste, hard wastes	Jolly *et al*., 2009
Yarn spinning	Little or no wastewater generated, Packaging waste, sized yarn, fiber waste, cleaning and processing waste.	Ghaly *et al*., 2014
Slashing or sizing	Volatile organic compounds, BOD, COD, metals, cleaning wastes, size, Fiber lint,yarn waste, packaging waste, unused starchbased sizes.	Naresh *et al*., 2013
Weaving	Little or no wastewater generated, Packaging waste, yarn and fabric scraps, off-spec fabric, used oil.	Jolly *et al*., 2009
Knitting	Little or no wastewater generated, Packaging waste, yarn and fabric scraps, off-spec fabric	Agarry *et al*., 2011

Tufting	Little or no wastewater generated, Packaging waste, yarn and fabric scraps, off-spec fabric	Agarry *et al*., 2011
Desizing	Volatile organic compounds from glycol ether as air emission. BOD from water-soluble sizes, synthetic size, lubricants, biocides, anti-static compounds, Packaging waste, fiber lint, yarn waste, cleaning materials such as wipes, rags and filters, cleaning and maintenance wastes containing solvents.	Selim *et al*., 2015
Scouring	Volatile organic compounds from glycol ether as air emission. Scouring solvents, Disinfectants and insecticide residues, NaOH, detergents, fats, oils, pectin, wax, knitting lubricants, spin finishes, spent solvents.	Agarry *et al*., 2011
Bleaching	Hydrogen peroxide, sodium silicate or organic stabilizer, high pH.	Agarry *et al*., 2011
Singeing	Small amounts of exhaust gasses from the burners as air emission.	Mansour *et al*., 2012
Mercerizing	High pH, NaOH, Little or no wastewater generated.	Selim *et al*., 2015
Heat setting	Volatilization of spin finish agents applied during synthetic fiber manufacture. Little or no wastewater generated	Ghaly *et al*., 2014
Dyeing	Volatile organic compounds, metals, salt, surfactants, toxics, organic processing assistance, cationic materials, colour, BOD, sulfide, acidity or alkalinity, spent solvents.	Selim *et al*., 2015
Printing	Solvents, acetic acid from dyeing and curing, combustion gasses, particulate matter, suspended solids, urea, solvents, colour, metals, heat, BOD, foam.	Ghaly *et al*., 2014
Finishing	Volatile organic compounds, contaminants in purchased chemicals, formaldehyde vapor, combustion gasses, particulate matter, BOD, COD, suspended solids, toxic spent solvents. Fabric scraps and trimmings, packaging waste.	Jolly *et al*., 2009
Product fabrication	Little or no wastewater generated, fabric scraps.	Ghaly *et al*., 2014

Characteristic Features

The volume and characteristics of effluent are determined by the type of dying process and the class of dye used [Mansour *et al*., 2012]. Effluents are characterized by measuring BOD, COD, suspended solids (SS), total dissolved solids (TDS), colour, pH and other chemicals. Composite of effluent is mainly characterized by six aspects, as follow

- Colouration of effluent
- Toxicity of effluent
- Total organic carbon of effluent
- Adsorbable organic halogens of effluent
- Metals in effluent
- Salt concentration of the effluent

Remediation of Textile Dyes and Effluent

In order to reduce the risk of environment pollution from effluents, it is necessary to treat them before discharging it into the environment [Ghaly *et al*., 2014]. The effluents are diverse in chemical nature and hence are difficult to treat by conventional procedures. In fact, treatment like chlorination have been found to be inappropriate as they release mutagenic products from relatively less harmful dyes conventional treatment methods are not effective for most of the synthetic dyestuffs due to complex poly aromatic structure and recalcitrant nature of dyes. [Krishnakumari and Thangavel., 2017; Rahman *et al*., 2013].

Effluent Biodegradation by Plants (Phyto-remediation)

It's an emerging technology with effective and inexpensive approach for the remediation of soils and ground water contaminated with heavy metals and organic pollutants [Ghaly *et al*., 2014]. The main advantages are it's an autotrophic system with a large biomass that requires little nutrient input, it's easier to manage and environmental sustainable [Idris *et al*., 2007]. The colour reduction 72-77% was observed in wetlands vegetated with cocoyam plants [Ahmad *et al*., 2012] [Mansour *et al*., 2012]. An herb *Blumea malcommi* was found to degrade textile dye (RR 5B) [Bharathi and Ramesh, 2013]. Hairy root cultures of marigold *Tagetes patula* L are effectively decolourize the dye RR198 [Jolly and Islam., 2009]. In large scale application, have to be consider, the level of pollutants tolerated by plants bio available fraction of the contaminants and evaporation of volatile organic pollutants, requiring large areas to implant the treatment.

List of Plants involved in Biodegradation (Ahmad *et al*., 2012; Mozumder and Islam, 2010)

Brassica juncea	*Medicago sativa L.*
Ipomea palmata	*Moringa oleifera*
Sorghum vulgare	*Sesbania cannabina Per*
Saccharum spontaneum	*Aloe barbadensis*
Phaseolus mungo	*Blumea malcolmii*

CONCLUSION

The textile effluent consists of toxic compounds such as unused dye molecules, salts, solid wastes etc. which are very difficult to degrade. Among various ancient methods the biological methods were gained importance towards the environmental cleanliness and leads to the increased biodegradation rate when compared to the other methods, especially plants and algae involved in the biodegradation of the toxic, complex compounds to non toxic, simpler molecules. The use of plants in the process of biodegradation of effluents was considered to be beneficial, low cost effective, easy to cultivate and effective degradation rate. In similar way, the cultivation of algae is a simpler method and the cell culture maintenance also easier and low cost. In recent decades the use of plants and algae in the degradation of the environmental pollution are gained importance due to their advantages and successive degradation rate.

REFERENCES

1. Ahmad Ashfaq and Amna Khatoon. Waste Management of Textiles: A Solution to The Environmental Pollution *Int.J.Curr.Microbiol.App.Sci*, , 2014; 3(7): 780-787.
2. Allegre.C , P. Moulin , M. Maisseu , F. Charbit. Treatment and reuse of reactive dyeing effluents. *Journal of Membrane Science*, 2006; 269: 15–34.
3. Bharathi, K.S and Ramesh,S.T Removal of dyes using agricultural waste as low-cost adsorbents: a review. *Appl Water Sci*, 2013; 3: 773–790.
4. Butani Naresh, Jobanputra Jaydip, Bhatiya Prabhat and Patel Rajkumar. Recent Biological Technologies for Textile Effluent Treatment. *International Research Journal of Biological Sciences*, 2013; 2(6): 77-82.
5. Fahim Bin Abdur Rahman, Maimuna Akter and M. Zainal Abedin, Dyes Removal from Textile Wastewater Using Orange Peels. *International Journal of Scientific and Technology Research*, 2013; 2(9): 47-50.
6. Ghaly AE, Ananthashankar R, Alhatta M and Ramakrishnan VV, Production, Characterization and Treatment of Textile Effluents: A Critical Review. *J Chem Eng Process Technol*, 2014; 5(1): 1-19.
7. Hedi Ben Mansour, Afef Dellai and Yosra Ayed, Toxicities effects of pharmaceutical, olive mill and textile wastewaters before and after degradation by Pseudomonas putida mt-2. *Cancer Cell Internationa*, 2012 12(4): 1-4.
8. Idris, A, Hashim R, Abdul Rahman R, Ahmad W.A, Ibrahim Z, Abdul Razak P.R, Mohd Zin H. and Bakar I,. Application of Bioremediation process for Textile Wastewater treatment using pilot plant. *International Journal of Engineering and Technology*, 2007; 4(2): 228-234.
9. Jolly. Y.N and Islam. A. Characterization of dye industry effluent and assessment of its suitability for irrigation purpose. *Journal of Bangladesh Academy of Sciences*, 2009; 33(1): 99-106.
10. Krishnakumari. G and M.Thangavel. Analysis of Phytotoxicity effect of untreated and Pseudomonas sp treated textile dye and effluents. *IJIR*, 2017; 3(1): 1168-1170.
11. Krishnakumari. G and M.Thangavel. Immobilization of Bacterial isolates and its effect on Biodegradation of Azo dyes. *IJEP*, 2017; 37(6): 503-508.
12. Mir Tariq Ahmad, Manderia Sushil and Manderia Krishna. Influence of dye industrial effluent on physico chemical characteristics properties of soil at Bhairavgarh, Ujjain, MP, India. *I Research Journal of Environment Sciences*, 2012; 1(1): 50-53.
13. Mozumder, M.S.I and M. A. Islam. Development of Treatment Technology for Dye Containing Industrial Wastewater *J.Sci.Res*, 2010; 2(3): 567-576.
14. Naeem Ali, Abdul Hameed, Safia Ahmed. Physicochemical characterization and Bioremediation perspective of textile effluent, dyes and metals by indigenous Bacteria. *Journal of Hazardous Materials*, 2009; 164: 322–328.
15. Rita Kant. Textile dyeing industry an environmental hazard. *Natural Science*, 2012; 4(1): 22-26.
16. Samuel E. Agarry, Ayobami O. Ajani. Evaluation of Microbial Systems for Bio treatment of Textile Waste Effluents in Nigeria: Bio decolourization and Biodegradation of textile Dye. *J. Appl. Sci. Environ. Manage*, 2011; 15(1): 79 – 86.
17. Yang Huifang, Wang Kaimin, Jia Shengfen, Qu Angni and Xian Haijun. The Addition of Microbes for treating Textile waste water. *Journal of Environmental Sciences* (China), 1991; 3(1): 95-100.
18. Zongping Wang, Miaomiao Xue, Kai Huang and Zizheng Liu. Textile Dyeing Wastewater Treatment Advances in Treating Textile Effluent, Prof. Peter Hauser (Ed.), ISBN, 2011; 978-953-307-704-8.