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Treatment of Textile Processing Effluent Using Bacterial Isolate and Activated Charcoal

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KEYWORDS

Effluent, BOD, COD, bioremediation, B. *licheniformis,* seed germination

ABSTRACT:
Textile industries consume a huge quantity of water for their processes and generate an almost equal quantity of wastewater. Effluent Sample of textile processing industry was collected and physicochemical analysis was performed as per the standard protocol of APHA 2017. The high value of Biological Oxygen Demand (BOD), Chemical Oxygen Demand (COD) and adverse effect on wheat seeds, this highlights effluent is a highly toxic and hazardous effect to the ecosystem. Bacterial isolate identified as *Bacillus licheniformis* was screened for various hydrolytic enzymes and explored for effluent treatment, it showed a reduction in BOD by 50% and COD by 53%. The bacterial treatment followed by physical treatment by activated charcoal, resulted in 97% and 98% reduction in BOD and COD respectively. After treatment, the toxicity assessment by seed germination was performed and 90% germination of the wheat seed was increased in comparison with untreated effluent. Textile wastewater has very high amount of organic compound which makes this effluent very toxic and hazardous to environment. The combination of biological and physical treatment method shows significant reduction in terms of BOD, COD and toxicity which makes this combined treatment method more appropriate for such type of effluent.

1. Introduction

The textile industry is one of the rapidly emerging industrial sectors in India. It contributes 5% to the country's total GDP and India is the 6th largest exporter of textiles globally. It uses different raw materials like cotton, woollen, and synthetic fibers [1]. The problem of the textile industry is the massive consumption of water which transform into highly loaded by different chemicals of wastewater [2]; this wastewater contains chemicals like acids, alkalis, dyes, hydrogen peroxide, starch, surfactants dispersing agents, and soaps of metals, organic and inorganic chemicals [3,4]. The textile industry is estimated to use more water than any other industry and, almost all wastewater discharged is highly polluted and thus has a serious environmental impact. The level of dissolved oxygen decreases continuously and is a serious issue concerning the aquatic ecosystem. The dissolved oxygen should be at least 5 mg/l for survival of aquatic life [5]. Average-sized textiles mills consume water about 200 L per kg of fabric processed per day [6,7]. According to the World Bank estimation, textile dyeing and finishing treatment are given to a fabric that generates around 17 to 20 percent of industrial wastewater [7].These effluents contain high amounts of fatty acids, proteins, carbohydrates, and other plant materials. The effluents are diversified, and majorly possess higher amount of organic compounds of biodegradable nature [8], but their high amount results in a severe impact on environment [9,10, 11,12, 13, 14, 15].

Textile industrial effluent having dyes and other chemicals adversely affect to aquatic as well as agriculture land. Because of some industrial unwillingness and profit-making attitude their wastewater treatment plant not even working, and some are suffering due to shortage of material, time, infrastructure, land, manpower, and capital consumption [16]. Textile wastewater treatment is majorly done in effluent treatment plants (ETP). This treatment plant follows a series of treatment processes that mainly focus on different water quality parameters such as pH, temperature, color, electrical conductivity (EC), alkalinity, acidity, total dissolved solids (TDS),