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# Impact of Textile Mill Effluent load on Soil Microflora

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**ABSTRACT**

Textile industry is one of the most important and potent industry that contributes high COD, color and organic matter in the form of wastewater to aquatic bodies. The textile industries are also one of the most important sectors that utilize water and releases wastewaters with changeable characteristics and are of complex nature Soil is considered as the most congenial habitat for a wide range of microbes which include viruses, bacteria, microalgae, protozoa microfungi, etc. Industries are continuously discharging toxic effluents that generate problems for the survival of soil-inhabiting microflora as a result of deleterious effect of toxic chemicals. Textile industries are not an exception. In the present investigation the effluent of textile industry have been analysed and their deleterious effects on the soil microflora was studied. Physico-chemical analysis was done by standard methods of APHA and bacteriological analysis was done by standard dilution plating technique. Most of the physico-chemical parameters of effluent samples exceeded the permissible limit. The results showed that the bacterial counts decreased due to pollution of the soil samples by the effluents from textile mill. The microbial flora was adversely affected by the effluent in comparison with the control water sample due to high BOD and COD values.

**Keywords -** Textile mill waste, soil microflora, BOD, COD

## INTRODUCTION

India's one of the largest organized sector is textile industry and impact of textile mill's wastes on environment has well been documented (Patel and Shrivastava, 1999). Textile mills generate pollutants chiefly during processing of cloth, which consists of scouring, bleaching, mercerizing, dyeing, scouring, bleaching, mercerizing, dyeing, printing and finishing operations. Such operational processes include use of a huge number of chemicals including alkalies, acids, dyes, oil, detergents, etc (Mathur and Bhatnagar, 2003). The wastes discharged from textile industries cause surface and groundwater as well as soil pollution, besides causing a number of adverse effects on agricultural products, animals and health of people living in that area. The deterioration of quality of soil ultimately affects the groundwater quality and crops or other vegetation production in the vicinity of the contaminated areas. The toxicity accumulated in the soil through effluents may persist for several years and detrimental effects may be felt aver a long period of time (Deka and Bhattacharyya, 2007). In the present study, an attempt has been made to assess the impact of textile industries on the soil quality by monitoring various microbiological parameters of contaminated soil of textile industries.

## MATERIALS AND METHODS

### *Study area*

The textile mill effluent samples were collected from Sunil Ghosh Printing shop, ChatraBou Bazar, Sheoraphuli, west Bengal, India(22.7705° N, 88.3220° E ).

### *Sample collection*

The effluent samples from the textile mill was collected as per standard procedure (APHA,1989) and were analyzed in the environmental Microbiology Research Laboratory of the department.

### *Physico-chemical analyses of textile mill effluents*

Sampling site was selected at point where effluent is discharged from the textile mill. The colour and odour of the effluent was recorded during sampling in sterilized containers. Other physico-chemical parameters viz. pH, total dissolved solids, total suspended solids, biochemical oxygen demand and chemical oxygen demand were analyzed as per standard methods as given by APHA (1989).

***Bacteriological analyses of the Soil samples***

One gram of soil sample was added to 9ml of sterilized water and stirred vigourously. 1ml of this mixture was then mixed with 9ml sterilized water to make $10^{-2}$ dilution and in the same pattern upto $10^{-4}$ dilutions were made. 20g of nutrient agar was kept in 1000ml graduated flask and the volume was made upto mark by adding sterilized water. The pH of the media was adjusted with cone. NaOH or conc.$H_2SO_4$ . Then the medium was sterilized in autoclave at 15 psi and 120$^o$ C for 20min and cooled to a pouring temperature of about 37$^o$C. Serial soil dilutions were made for proper enumeration of the bacterial population. One ml of the required dilution was spread evenly on the petriplates containing agar to determine the number of populations per g soil incubation of the petriplates was done in the laboratory set at 35(+/- 2)$^o$ C (Harley and Prescott, 1993).

## RESULTS AND DISCUSSION

The different pysico-chemical parameters of the textile mill effluents analyzed are presented in table 1. The results revealed the high levels of pH(8.2) and fell within the permissible limits. The effluent pH was towards the higher value indicating the alkaline condition and thus will have an adverse effect on the soil permeability as well as on soil microflora. The values of TDS and TSS were 4562 mg $l^{-1}$ and 212 mg $l^{-1}$ respectively which exceeded the permissible limits and were high in respect of the control sample indicating soil pollution. The concentration of solids is another matter of concern and the carcinogenicity of the dyes used adds to it. The values of BOD (192.5mg $l^{-1}$ ) and COD (3684.2 mg l ) as compared to the control sample indicated high level of pollution of effluent discharged from the textile mill into the environment. The high BOD Value are indicators of pollutional strength of water and effluent. They also indicate the less oxygen availabity in the wastewater for living beings. The high level of COD value indicated the toxicity of the effluents and the presence of huge amount of biologically resistant organic substances[6-10] ( Sawer and Mc Carty, 1978; Mc Mullan et al.,1995; Robinson et al.,2002; Yusuff and Sonibare,2004; Geetha et al.,2008).The results in Table 2 indicated a decrease in the bacterial soil microflora as compared to the control. The textile mill effluent polluted the soil continuously to a larger extent , which is probably due to the higher BOD and COD values of the effluents.The intensity of the colour change was also noticeable when the dilutions of soil samples were compared (Table 3) . The results showed that the bacterial counts decreased due to pollution of the soil samples by the effluents from textile mill.

Table 1. Physico-chemical analysis of the textile effluent sample.

| Parameters | Effluent | FMENV limit | NEQS/BIS limit |
|---|---|---|---|
| pH | 8.2 | 6-9 | 5.5-9.0 |
| TDS | 4562 | 2000 | 2100 |
| TSS | 212 | 30 | 200 |
| BOD | 192.5 | 50 | 100 |
| COD | 3684.2 | 80 | 250 |

TDS total dissolved solids, TSS Total suspended solids, BOD Biochemical oxygen demand, COD Chemical oxygen demand.

Table 2. Bacterial count in the effluent contaminated soil samples.

| Sample | Bacterial count (cfu×$10^3$ ) |
|---|---|
| Control | 350 |
| Contaminated soil | 180 |

Table 3. Change of colouration of agar agar after 48h of incubation

| Sample | Dilution | Colour of Agar agar |
|---|---|---|
| Control soil sample | $10^{-2}$ | Yellow |
| | $10^{-3}$ | Yellow |
| Effluent Contaminated Soil Sample | $10^{-2}$ | Dark brown |
| | $10^{-3}$ | Muddy brown |

## CONCLUSION

In developing country like India small scale industrial units such as textile mills from a major industry and in fact treatments of textile mill effluents are not taken care of. The costs of water treatment add to woes of the sick smaller units. As a result, the important parameters like pH, TDS, TSS, BOD and COD are always above the permissible limits. These effluents exert deleterious effects on the soil near the vicinity of effluent discharge. The present investigation revealed that the effluents made the soil unsuitable for any type of cultivation of crops or vegetables. The heavy bacterial load dominated the soil samples. The elevated levels of TSS and TDS are the major cause of concern due to increased incidence of cancer.

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