

STUDY OF PHYSICO- CHEMICAL PROPERTIES OF DIFFERENT INDUSTRIAL CONTAMINATED SOIL

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ABSTRACT

The present study was carried out to study the physico-chemical parameters of the soil contaminated with tannery (Agragaram, Semur and Suriyampalayam) and dyeing effluent (Chittode, Gangapuram and Ingur) from three different sites of Erode District. Agragaram has highest pH (9.2) contaminated with tannery effluent. Ingur has highest pH (8.9) contaminated with dyeing effluent. The parameters studied were above the permissible limit. So there is urgent need to follow adequate effluent treatment methods before their discharge for reducing their potential environmental hazards.

KEYWORDS: physico-chemical parameters, tannery, dyeing, effluent, soil.

INTRODUCTION

India's environment is become fragile and environmental pollution is one of the undesirable side effects of industrialization, urbanization, population growth and unconscious towards the environment. Erode district lies between 10.36°C and 11.58°C degree of northern latitude and between 76.49°C and 77.58°C degrees of the eastern longitude and 171.91 m above mean sea level. It has an area of 8,162 square kilometres accounting for 6.3 -of the total area of the state. Agriculture is the most important income source of the district. Total cultivated area is 37.89 of the total area. As per the survey conducted, about 150 dyeing units and 20 tanneries are in operation is catchment area and expected to discharge the trade influent (both treated and untreated) either directly or indirectly through drain (Sivakumar *et al.*, 2010). The increase in the concentration of the dissolved solids in the soil indicates the mixing of untreated effluent.

Heavy metals and organic compounds affect quality of soil and ground water of the area (**Bhallacharjee *et al.*, 2003**). Heavy metals enter in the human body by different pathways and causes harmful effects (**Gitimoni *et al.*, 2009**). Through industrialization and development in agriculture are necessary to meet the basic requirement of people, at the same time it is necessary to preserve the environment with the rapid industrialization in the country environment pollution by industrial waste has increased tremendously (**Noorjahan, 2014**).

MATERIALS AND METHODS

The soil (adjoining the textile and tannery effluent) samples were collected from Erode district. The soil (adjoining tannery effluent) samples were collected from Agragaram, Semur and Suriyampalayam in Erode district. The soil (adjoining dyeing effluent) samples were collected from Chittode, Gangapuram and Ingur. Samples were collected sterilized plastic bags and stored at 4°C. Soil samples were air dried, processed to pass through 2mm sieve. The soil samples have been analysed for various parameters as pH using a combined electrode pH meter and conductivity bridge respectively (**Jackson, 1973**). Heavy metals such as Chromium, Copper and Zinc were also analyzed (**Clesceri, 1998**). Available of Nitrogen, Phosphorus and Potassium determined by Trimetric method (**APHA, 2005**). The presence of Sodium, Chloride, Calcium, Magnesium were analyzed.

RESULTS AND DISCUSSION

The soil samples adjoining (tannery and dyeing effluent) of the physico chemical parameters. The pH of soil has alkaline in nature and higher than of standard values. The pH of the soil samples ranged 7.8 to 9.4 and higher than that of standard values. In tannery soil Agragaram have highest pH (9.2). In dyeing effluent Ingur have highest pH (8.9). The values of electrical conductivity ranged from 0.79 to 2.15 mm/hos/cm and were quite high. The high value of electrical conductivity might be due to the presence of high concentration ions and dyes. The present investigations on high pH and high electrical conductivity values of the soil samples electrical conductivity were the agreement with the results of the survey conducted by **Gupta *et al.*, (1994)**. High colour intensity, pH and physicochemical parameter of were high in untreated tannery waste water also discussed by **Sharma *et al.*, (2007)**.

Nitrogen of the industrial soil sample ranged from 0.6% to 1.1% and this value was higher than that of standard value of 0.4%. Phosphate of the soil sample ranged 0.8mg /kg to 0.98 mg/kg and higher than that of standard value 0.7 mg/kg. Potassium of the industrial soil sample ranged 51.6 mg/kg to 60.6mg/kg and very higher than that of standard values 33

mg/kg. Value of nitrogen (N), phosphate (P) and potassium (K) concentration in the soil samples were also shows to have great variability.

Presence of heavy metals (Cr, Cd, Cu and Zn) were very high value compare to permissible limit. In tannery soil, chromium was highest value (25.20ppm) recorded in Agragaram. Chromium is one of the most important pollutants released from the tannery industries and the biggest problem is its disposal and recovery. Chromium is a potential pollutant and mutagenicity (**Cheng and Dixon, 1998**) and carcinogenicity (**Wang *et al.*,1999**) effects in humans, animals and plants. In dyeing soil, Chromium was highest value recorded in Ingur (17.20 ppm). In tannery soil Cadmium ranged from 5.3 to 7.67ppm. In dyeing soil Cadmium ranged from 5.2 to 7.8 ppm. In tannery soil, copper was highest value recorded in Agragaram 2.8 ppm. In dyeing soil, copper was highest value recorded in Gangapuram. Zinc ranged from 1.3ppm to 1.75ppm respectively. The tannery effluent soil is being contaminated with higher levels of metals (iron, chromium, zinc, cadmium, manganese and copper) and these metals contaminate the agricultural soil. The crops and vegetables, which when consumed cause serious health hazards to the consumer (**Mohanta *et al.*, 2010**). Regular usage of textile effluent for irrigation purpose it can accumulate heavy metals in the soil. The study reveals that the soil was highly polluted by tannery and dyeing and tannery effluent. The remedy should be taken quickly as far as possible.

Table 1: Analysis of physicochemical parameters for tannery and dyeing effluent soil.

S.No.	Physicochemical Parameters	Tannery soil			Dyeing soil			Permissible Limit
		Sample A	Sample B	Sample C	Sample D	Sample E	Sample F	
1	pH	9.2	8.9	8.1	8.9	8.5	8.0	7.4
2	E. Conductivity (mm/hos/cm)	2.15	2.02	1.90	2.12	1.82	0.79	1.5
3	Organic Carbon (%)	0.97	0.82	0.77	0.89	0.82	0.79	0.75
4	Nitrogen (%)	1.1	0.80	0.62	0.93	0.71	0.69	0.64
5	Phosphate(mg/Kg)	0.98	0.93	0.83	0.81	0.84	0.80	0.7
6	Potassium (mg/Kg)	60.6	58.6	51.6	59.1	56.6	52.3	33
7	Calcium (mg/Kg)	279	239	180	280	170	160	90
8	Magnesium (mg/Kg)	40	12.9	11.50	42	10.6	38	6
9	Heavy metals (ppm)							
	Zinc	1.75	1.5	1.3	1.50	1.60	1.2	0.6
	Copper	2.8	2.7	1.8	3.2	3.5	2.1	0.2
	Cadmium	7.67	6.5	5.3	7.8	6.8	5.2	0.32
	Chromium	25.20	16	13.10	17.20	15.40	11.60	6.7

Sample A	Sample B	Sample C	Sample D	Sample E	Sample F
Aragaram	Semur	Suriyampalayam	Ingur	Gangapuram	Chittode

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