Effects of industrial area of kotdwar and its adjoining region

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Abstract: The areas of Kotdwar city and it's adjoining region of Uttarakhand to evaluate the risk of pollution on water, soil and near industrial area. Water samples were checked for Total dissolved solids (TDS), Turbidity, pH, Alkalinity, Fluoride, Chloride and Total hardness. The soil sample was checked for pH and number of microorganism. Result were obtained and compared with the control (2kms apart from sampling area).The study concluded that industrial area may be polluted with organic pollutants which resulted in change in some chemical parameters of water mainly total hardness and change in soil pH.Soil sample collected from polluted areas. The polluted area due to increased stress level of microbial diversity was reduced near industrial areas. Sampling and analysis of soil, water is valuable to determine the physio-chemical parameters of the micro environment around the industries. The study concluded that the overall pigment and protein degradation were observed near industrial area and peroxidase activity and pheophytin values were found higher as compared to control, which may be due to temperature variations and presence of pollutants among various parameters of water quality; chloride and TDS was found to be higher around theindustries.

Keywords: Pollution, Biochemical parameters, Soil quality, Microbial diversity, Turbidity

INTRODUCTION

Soil is a important and essential elements that shapes the plants life layer as a medium of unconsolidate nutrients and material.soil is a multipart of physical and biological schemes which give support to the plants and supplies essential nutrients to them. the process of weathering disintegrate rock and transform it into soil nutrients.It forms a thin layer on surface. It contains minerals particles organic matters water and air(lein,2003). Alkalinity, Fluoride, Chloride and soluble potassium. The soil sample was checked for pH and number of microorganism. collected from polluted areas. soil contamination caused by diffuse sources althrough the groundwater was considered to have been without life for a long period. reaserch on the assesments of effects of pharmaceticals waste disposal on bacterial community in soil.the assesment of variation in microbial community structure is of fundamental importance for the evaluation of the impact of an enviroment stresser.

The occurence of soil contamination of natural microbial communities can significantly affects.soil moistureorganic carbonand potassium have a strong influence on the microbial biomass. The release of pollutants and wastediffers from industry to industry. For e.g. Leather industry waste is mainly composed of chromium, zinc , copper, sulphides, carbonates, sodium and many other toxic organic compounds and inorganic compounds Pulp industry mainly contain carbohydrates, textile industry contain dyes, plating industry contain nickel (Nouri et al., 2009). The present study was conducted to determine the impact of industrial pollution on water, soil and vegetation.The study concluded that industrial area may be polluted with organic pollutants which resulted in change in some chemical parameters of water mainly total hardness and change in soil pH. Soil sample collected from polluted areas.The polluted area due to increased stress level of microbial diversity was reduced near industrial areas.Sampling and analysis of soil, water is valuable to determine the physio-chemical parametersof the micro environment around the industries. which may be due to temperature variations and presence of pollutants among various parameters of water quality; chloride and TDS was found to be higher around the industries.

The present study was conducted to determine the impact of industrial pollution on water, soil The waste and pollutants from industries affect soil, water and vegetation equally. The release of pollutants and waste differs from industry to industry. For e.g. Leather industry waste is mainlycomposed of chromium, zinc , copper, sulphides, carbonates, sodium and many other toxic organic compounds and inorganic compounds Pulp industry mainly contain carbohydrates, textile industry contain dyes, plating industry contain nickel (Nouri et al., 2009). These pollutants not onlyalter the quality of soil and ground water but also pose serious problems (Karthikeyan et al.2010).Microbial activity in the ecosystem as they are sensitive to environmental conditions(Wardle 1992; Maithani et al.1996; Bardgett et al. 1999). They provide precise and immediate information on soil quality. Moreover, the variation in soil microbial biomass afects soil fertility and stability (Bardgett et al. 1999; Angst et al. 2018). Presence of large soil particles reduces the soil moisture content pores and consequently increases with soil organic matter level. It is related to soil moisture content, textural class, structure, salt content and organic matter. The increase in case of coarse textured soil is larger than that in the fine textured soil. Bulkdensity of the soil changes with land use and management practices. Organic matter supplied through the sludge and other kind of wastes which effect the soil.Schlesinger and Andrews 2000; Babur and Dindaroglu 2020; Luo et al. 2020; Srivastava et al. 2020; Wu 2020). Few studies also reported that soil biological changes are mostly afected by temperature, moisture and seasonal variations Maithani et al. 1996; Bardgett et al. 1999; Devi and Yadava 2006; Srivastava et al.2020).Seasonality is an important response of any natural ecosystem that has ramifcations over its biodiversity and ecosystem functioning (Tonkin et al. 2017).

Materials and Methods

The Study area and sample collection: The study areas were two cities of Uttarakhand, India. First was Dehradun situated between latitudes 29°58' N and 31°2'N and longitudes 77° 34' E and 78° 18'E and second Kotdwara situated between latitudes 29 °45'0 N and 31°2'N and longitudes 78° 31' 48E. The main industrial area of Dehradun was Selaqui, which is also known as pharmacity as it contains most of the pharmaceutical industries. In Kotdwara the main industrial area is Balbhadrapur,siggadi, jhandichaud the region with three main seasons winter (October—February), summer (March—June), and rainy (July—September). Soil samples were collected during winter, summer and rainy seasons during 2014–2016 from the temperate forest. soil samples were collected randomly from 0–15 to 15–30 cm soil depths using a soil auger. After removing the litter layer these were mixed to obtain composite samples. The soil samples were sieved (<2 mm) to remove stones, pebbles, roots and plant material and analysed for soil physico-chemical and microbial properties. Soil texture and moisture content were determined by following the Anderson and Ingram (1994). The pH of the soil was measured by using pH meter (Eutech, SN-2069212) with soil water suspension (1:2.5 w/v H2O).

Water Sampling:

For water analysis, two sampling sites were chosen one for control and other as polluted site from both the cities. Water Samples from different sites were collected in the plastic cane of 2.5 litre, about ½ litre water samples was collected from one hand pump from one site and these were mixed to get one sample from one site. In this way sample collected were analyzed in 2-3 days so no special preservationrequired.

Soil Sampling:

For soil sampling composite sampling was done, where sub-samples were collected from randomly selected locations in a field, and the subsamples are composited for analysis. The soil samples were then air dried and tested in laboratory.

Methodology:

For studying the impact of industrialization on soil and water near the industrial site was chosen and following parameters were compared between control site and industrial site.For water quality analysis around control and industrial site various water parameters like Total dissolved solids (TDS), Turbidity, pH, Alkalinity, Fluoride, Chloride and Total hardness were analyzed using water testing kit. For assessing the impact of industrialization on soil, soil pH was measured and number of microbial activity determined by plate countmethod, around control and industrial site

Results and Discussion-

Source of pollution —The industries in SIDCUL(Kotdwar) region were started in 2013.Nearly 35 industries are established and prosper at the Sigaddi growth center. and now they are generating about millions of litres of effluents per day. Appox 70 -80% ofeffluents are discharge into the soil surface and underwater bodies. The effluents are not only rich in waste but also contain toxic materials which is dangerous and hazardous toman. The major industries draining effluents into soil surface and ground water bodies.Near SIDCUL kotdwar the iron industries also effects soil surface and soil microbes withtheir effluents.Physico chemical parameters

Effect of industrialization on water Quality:-

For assessing the quality of water for drinking purpose in these two cities various water parameters were tested and compared with values of ISI.The value of pH in control and industrial site of Kotdwara was same but in case of Dehradun pH varied from control to industrial from 7.5 to 6. pH value in both the cities was within desirable limit of 6.5-8.5. The value of pH was in accordance with the alkalinity value, which decreased from control site to industrial site of Dehradun i.e from 200mg/l to 100mg/l and in case of Kotdwara it was 200mg/l in control site and 150 mg/l in industrial site.The desirable limit of TDS is 300mg/l but in both the cities the TDS value was greater than desirable in both control and industrial site. But from control to industrial there was increase of TDS value from 692mg/L to 750 mg/l in Kotdwara and 698mg/l to 780 mg/l in Dehradun which indicates that increased pollution by extraneous sources can adversely affects the quality of water. The value of Turbidity was 0 NTU in both control and industrial which is desirable. The total hardness which is mainly caused due to calcium and magnesium salts were within the desirable limit of less than 300 ppm. The desirable limit of chloride according to ISI is 250 ppm and in both cities the value of chloride decreased from control to industrial site.

Effect of industrialization on soil Quality:

For assessing the impact of industrial pollution on soil, the soil pH and microbial growth from the soil sample was analyzed. Soil pH or soil reaction is was found to be lower in industrial area of both the cities as compared to control site. The soil with pH greater than 8.5 is generally called as sodic soil. But pH of all soils samples are less than 8.5 indicating that soil samples are free from sodicity hazards. The decrease in pH could be due to the decreased amount of carbonate and bicarbonate but overall the pH value neither too high (more than 8.5) nor too low. The samples were analyzed for microbial growth and it was observed as that there was reduction in the growth of microorganisms at different dilution in both the industrial sites as compared to control site. The pH between 6-8 is favorable for bacterial growth therefore in comparison to fungus bacterial count was found higher in all the samples. The decrease in

number of microorganism both fungus and bacteria near industrial site as compared to control site may be attributed to altered pH of soil and water quality condition.

Physico chemical parameters — The change in soil pH and organic carbon, total nitrogen, total phosphorus and organic matter (percent dry weight basis) contents were determined following standard procedures. The physic —chemical characters like Turbidity and conductivity, pH , temperature, chlorides, Sulphate, nitrates, phosphate and total hardness have increased in the water of the impacted site.

Ecological damage in the vicinity of two.

Table1. Detail of sample location collected from Kotdwara

Sample Source	Sample ID	Latitude	Longitude
1. Underground Water	KWS (sample)	29. 472124°	78.245518°
2. Underground water	KWC (control)	29.472806°	78.259603°
3.Soil Sample	KSC (control)	29.472806°	78.259603°
4.Soil Sample	KSS (sample)	29.472124°	78.245518°

Table 2. Detail of sample location collected from Dehradun

Sample Source	Sample ID	Latitude	Longitude
1. Under ground Water	DWS (sample)	30.364452°	77.858186°
2. Under ground water	DWC (control)	30. 348341 °	77.890194 °
3.Soil Sample	DSC (control)	30. 348341 °	77.890194 °
4.Soil Sample	DSS (sample)	30.364452°	77.858186°

Table 3: Effect of industrialization on water quality

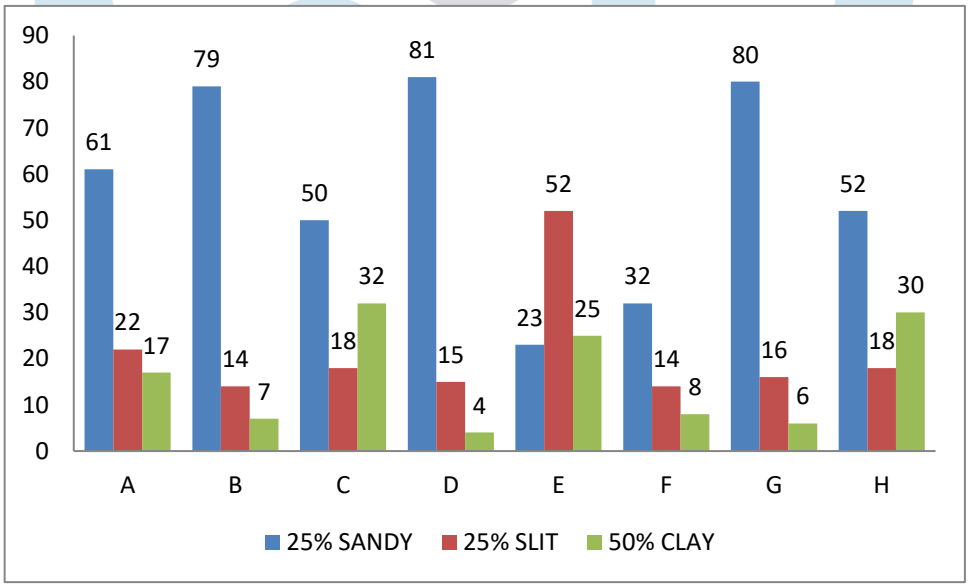
PARAMETER	KOTDWARA.		DEHRADUN	
	KWC	KWS	DWC	DWS
TDS (gm)	**0.6924**	**0.7502**	**0.6986**	**0.7894**
Turbidity	**0.0**	**0.0**	**0.0**	**0.0**
pH	**7.0**	**7.0**	**7.6**	**6.6**
Alkalinity (in ppm)	**200**	**150**	**200**	**151**
Fluoride (in ppm)	**0.0**	**0**	**0**	**0**
Chloride (in ppm)	**78**	**115**	**69**	**92**
Total hardness (in ppm)	**300**	**211**	**140**	**175**

Table 4: Effect of industrialization on soil pH

Dilution	KOTDWARA.		DEHRADUN	
	KSC	KSS	DSC	DSS
1:2	6.0	6.0	6.9	6.3
2:1	7.0	6.1	6.8	6.4
1:1	7.0	6.2	6.8	6.5

Table 5. Microbial growth observed for soil sample.

(cfu/g)	KOTDWARA.		DEHRADUN	
	DSC	DSS	KSC	KSS
Total bacterial count(10-6)	56	16	700(approx)	175
Total fungal count(10-6)	3	00	3	0
Total viability (10-6)	59	16	703(approx)	175



CONCLUTION-

Sampling and analysis of plants, soil, water is valuable to determine the physio- chemical parameters of the micro environment ar. These changes in plants are biological compensatory responses to environmental stress. Among various parameters of water quality; chloride and TDS was found to be higher around the industries. Talking about ecological study the population density of plants and microbes were found less around industrial sites which shows that there is an impact of industries on population density of organisms andplants. Soil, water and biodiversity are essential elements of ecosystem and are the subject of many agricultural, ecological, biological and hydrological studies, since large amounts of chemicals enter animal and human food chain through cultivated contaminated soils and water. The study concludes that there is a need to access the ecological risk associated with the polluted areas and necessary action must be taken in this direction.

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